The Paper Industry

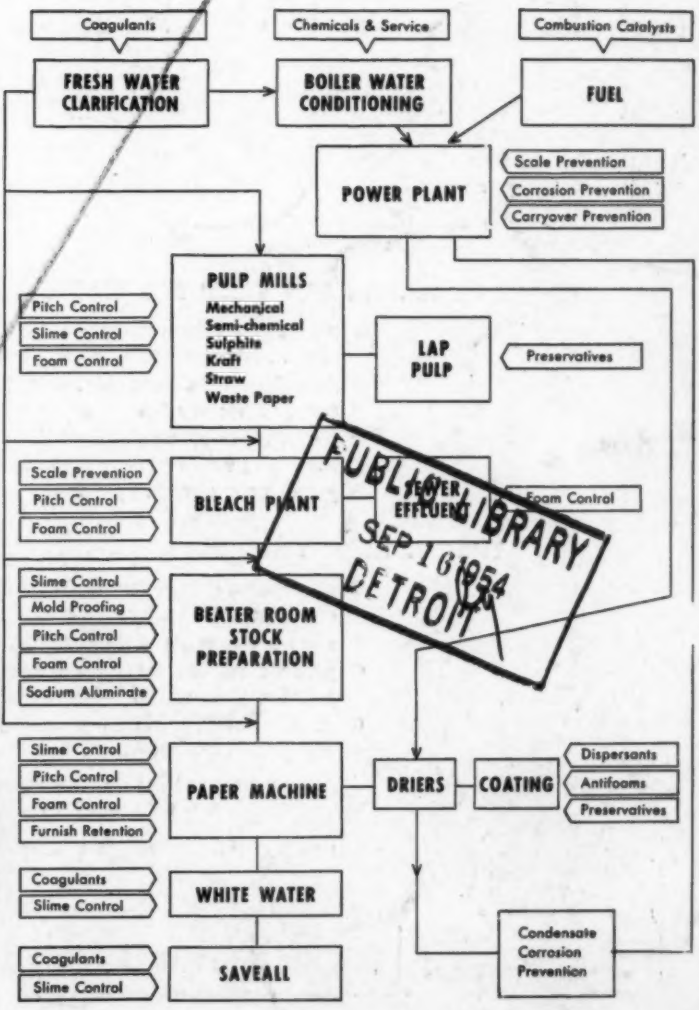
Chemicals in Increased Productivity

CHART of Nalco®

PRODUCTS and SERVICES for the PAPER INDUSTRY

FROM raw water through final recovery, Nalco chemicals and services help produce better pulp and paper products...speed processing...save time and money. Details on the chemicals and services outlined here are contained in Nalco Bulletin 55. Write for your copy today—or ask your Nalco Representative for answers to your problems.

NATIONAL ALUMINATE CORPORATION
6232 West 66th Place • Chicago 38, Illinois
Canadian inquiries should be addressed to Alchem Limited, Burlington, Ontario



THE Nalco SYSTEM • Serving the Paper Industry through Practical Applied Science

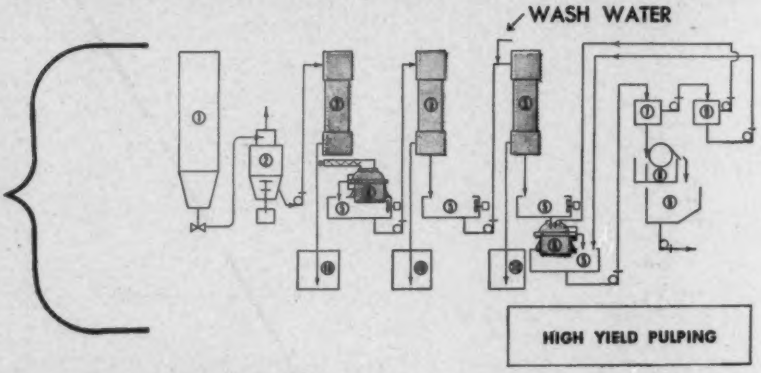
PUBLIC LIBRARY SEP 16 1954 DETROIT

FOAMING OR SOAPING

no longer a problem!

the J-C HIGH YIELD PULPING SYSTEM for kraft or semi-chemical stock improves product . . . cuts cost . . . eliminates foaming or soaping problems through refining at high density.

(1) Digester
(2) Blow-Tank
(3) Press Washers
(4) Roto-Pulper-defibrator
(5) Chests
(6) Roto-Pulper-denodulizer
(7) Primary Screens
(8) Thickener
(9) Tailings-Screen
(10) Black-liquor tanks



IN THE J-C HIGH YIELD PULPING SYSTEM—

- ***pressure washers replace diffusers or vacuum washers . . . can operate at higher temperature***
- ***Roto-Pulper defibers chips at 40% consistency . . . cuts power costs per ton***
- ***Roto-Pulper serves a dual function of denodulizing the fibers while at the same time refining tailings . . . produces a stronger pulp***

THE J-C HIGH YIELD PULPING SYSTEM—

- ***gets pulp cleaner with less dilution—requiring less evaporator capacity***
- ***allows adequate time for diffusion between stages***
- ***gives complete freedom from foaming or soaping problems connected with conventional systems***
- ***requires smaller chests, pumping and piping . . . cuts equipment and installation costs.***

Our engineers are ready to assist with your paper and pulp processing problems. Write to our Engineering Department, Zenith Division or your nearest representative.

The Taylor Corp.
Export Division
46 Trinity Place
New York 6, N. Y.
Phone BO 9-6496

Homad Services Ltd.
1445 Crescent St.
Montreal 25, P.Q.
Phone Belair 5419

John D. Homan
714 S. Orleans Ave.
Tampa 6, Fla.
Phone Tampa 8-3952

M. O. Grove & Co.
310 Sacramento St.
San Francisco 11, Calif.
Phone Yukon 6-1611

Jas. Brinkley & Co.
417 Ninth Ave. So.
Seattle 4, Wash.
Phone Maine 0062

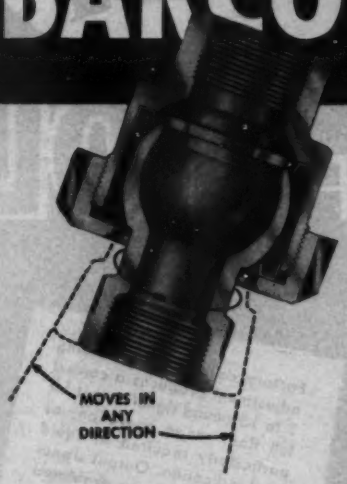
JACKSON & CHURCH CO. SAGINAW, MICHIGAN

J-C

Work well done since eighty-one

BARCO *Flexible* BALL JOINTS

SOLVE ANOTHER PROBLEM!



1. **MAXIMUM FLEXIBILITY.** Up to 40° side flexibility with 360° rotating movement.
2. **CHEMICALLY INERT GASKETS.** Barco offers a choice of seven types of gaskets including No. 11-CT for corrosive service. No lubrication required.
3. **NO METAL-TO-METAL CONTACT BETWEEN MOVING PARTS.** An important Barco advantage where corrosive chemicals are present, either externally or internally.
4. **STAINLESS STEEL.** Also regularly furnished in Malleable Iron, Steel, Bronze and Aluminum. Other special alloy joints to order.
5. **PRESSURE-SAFE! FIRE-PROOF!** Unequaled for SAFETY where flexible connections are required.
6. **MANY STYLES AVAILABLE.** Angle or straight; threaded or flanged connections. For pressures to 7,500 psi; temperatures to 1000°F. 15 different sizes, ¼" to 12".

ASK FOR YOUR COPY OF BULLETIN No. 215

OTSEGO FALLS PAPER MILLS, OTSEGO, MICHIGAN, HAD A TOUGH PROBLEM! Their four digesters rotate at about 1/5 RPM carrying steam and liquors under pressure. The connections between the rotating digester and the steam inlet pipe and blow-down pipe at either end were ordinary swivel joints. Because they couldn't get accurate piping alignment, these swivel joints failed due to strain and caused expensive down-time and maintenance.

Otsego solved its problem with eight Barco 4" 7F-8F Malleable Iron *Flexible* Ball Joints which are automatically *self-aligning*. Their extremely rugged construction and simple design also insure long-lasting, trouble-free service even with rough usage.

This is but one of many installations in industry where Barco Joints are used to allow movement in piping conveying steam, water, chemicals, and other fluids. When you want to be sure of getting SAFE, long-lasting, trouble-free installations, specify BARCO! Ask our engineers for recommendations. *Worldwide Sales and Service.* BARCO MANUFACTURING CO., 526K Hough Street, Barrington, Illinois. In Canada: The Holden Co., Ltd., Montreal.

BARCO

THE ONLY TRULY COMPLETE LINE OF FLEXIBLE BALL, SWIVEL, SWING, AND REVOLVING JOINTS

It's Quality Deserves Consideration

FISHER®

LEVEL-TROL®

UPPER and LOWER SIDE CONNECTIONS

TOP and LOWER SIDE CONNECTIONS

UPPER SIDE AND BOTTOM CONNECTIONS

Factory calibrating or zeroing adjustment produces a correct 3 to 15 pound signal output for full float range operation, as particularly required in liquid level indication. Output signal of controller is linear as related to level height change.

Simple level adjustment indicating dial.

Pneumatic proportional band and specific gravity adjustment combined in one member.

Small compact relay unit, minimum working parts.

★ All welds are in accordance with ASME code for unfired pressure vessels.

Universally Accepted for

- LIQUID LEVEL CONTROL
- LIQUID LEVEL INDICATION
- INTER FACE CONTROL

Engineered for peak performance the Fisher Series 2500 Level-Trol is designed to give rugged, trouble-free service. It is high in sensitivity and accuracy . . . it is versatile in handling all kinds of liquids, with minimum service attention.

Fisher Bulletin F-3 gives full details . . . write for your copy today!

FISHER GOVERNOR COMPANY • Marshalltown, Iowa

WORLD LEADER IN RESEARCH FOR BETTER PRESSURE AND LIQUID LEVEL CONTROL

FISHER Since 1880

®

R

80

1954

The Paper Industry

Technology • Engineering • Management • Production

VOLUME 36 • NUMBER 6 • SEPTEMBER 1954

Published monthly by:
FRITZ PUBLICATIONS, INC.
Edward B. Fritz (1869-1939), Founder

Publication Staff:

President and General Manager
A. SCOTT DOWD

Vice President and Treasurer
A. C. L. FRITZ

Secretary
A. C. BRUCE

Editorial Director
A. W. J. DYCK, Ph.D.

News Editor
D. W. ZEIGLER

Editorial Assistant
CAROL M. JOHNSON

Sales Manager
R. M. McFARLAND

Production Manager
CHARLES E. DOWD

Circulation Manager
JOHN H. REARDON

Advertising Representatives:

BOSTON 16: Meade & Company, 471 Statler Building, Liberty 2-9677.

CHICAGO 5: Jack Henderson, 431 South Dearborn Street, Wabash 2-3543.

LOS ANGELES: Murray Bothwell, 234 East Colorado St., Pasadena, Calif., Ryan 1-9155.

NEW YORK 20: L. S. van Nydeck, 9 Rockefeller Plaza, Circle 7-3085.

NEW YORK 25: Harry A. Johnston, 945 West End Avenue, Academy 2-6984.

PORTLAND: Murray Bothwell, 234 East Colorado St., Pasadena, Calif., Ryan 1-9155.

SAN FRANCISCO: Murray Bothwell, 234 East Colorado St., Pasadena, Calif., Ryan 1-9155.

THE PAPER INDUSTRY—founded in 1919—known as "The Paper Industry and Paper World" from June, 1939, through December, 1949, assumed its original title with the January, 1950, issue.

Published at 1501 Washington Road, Mendota, Illinois.

Address all correspondence intended for publication to Editorial and Executive Office, 431 South Dearborn Street, Chicago 5, Illinois.

BPA

Member: Business Publications Audit of Circulation, Inc.

Entered as second class matter February 18, 1954, at the post office at Mendota, Illinois, under the Act of March 3, 1879.

Subscription rates: United States, U. S. Possessions, and Canada, $3.00 for one year, $5.00 for two years, $6.00 for three years. All other countries, $3.00 for one year, $18.00 for three years, payable in advance in U. S Funds.

Features . . .

A Focus Issue—increased productivity through chemicals

Chemicals and increased productivity 571

How important are chemicals in papermaking? 572
by Ralph W. Kumler and John B. Calkin

Chlorine dioxide bleaching 575
by W. Howard Rapson

Some selected uses of chemicals 579
A staff presentation

Bleaching with peroxides—and the use of peroxides in waste paper recovery 584
A staff presentation

The dyeing of paper 589
by H. A. Lips and D. P. Graham

Neoprene-treated paper's new look 593

Anti-corrosive paints in the pulp and paper industry 594
by John J. Oates

Ultra high density peroxide bleaching 595
by William J. Nolan and Bruce Armstrong

Acknowledgments 596

News . . .

News of the Industry 599
Necrology 611
Allied News 613
Association News 617
Names in the News 619
Safety News 623

Departments . . .

Current Comments 567
Financial Reports 568
Paper Sketches 597
Coming Events 618
Foreign Abstracts 629
Patent Reviews 634
New Products 637
New Literature 643
Current Market Quotations 646
Index to Advertisers 648

The PAPER INDUSTRY is indexed regularly in **Engineering Index** and **Industrial Arts Index.** An index to each volume is issued annually by the publisher as a part of the April number.

Copyright 1954, by Fritz Publications, Inc.

Edgar

SPRAY-SATIN

a new coating clay . . .

FINE FRACTION · SPRAY DRIED · HIGH QUALITY

a finer product for you

HIGHEST SHEET STANDARDS . . . demanded today by an increasing number of mills producing for quality conscious customers . . . were the reasons for the development of **SPRAY-SATIN** . . . an entirely new, but production proved, fine fraction coating clay.

Spray Drying - another Edgar First

For many years it has been known that the purest and most uniform clays could be produced by the "Spray Drying Method" . . . this is the same process used to make your morning's instant coffee. Many years of experimentation, development and commercial production by Edgar technicians have made "Spray Drying" a commercial success. The result is a new $750,000.00 plant expansion to provide you with the finest coating clay modern technology can produce.

try SPRAY-SATIN *in your own plant*

with these solid

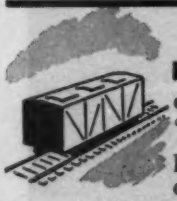
cost saving advantages

BONE DRY— Only with Spray Drying can you have a guarantee of less than 1% moisture without ever having the clay over-dried. In SPRAY-SATIN you will never find a pinhead . . . never a particle of calcined clay.

HIGHEST PURITY—In addition to finer than usual mechanical screenings, the spray drying process makes possible a magnetic screening of the slip to produce a purity of product never before achieved.

FREE FLOWING — EDGAR SPRAY-SATIN flows like sand. There is no caking, no arching in silos. Works wonderfully in airveyors and gravity flow systems. You will experience real cost savings in the handling of SPRAY-SATIN.

HIGH UNIFORMITY— Day in and day out and year in and year out, the spray drying process produces a product of unmatched uniformity. The precise controls of the spray drying method makes this high uniformity possible.



HIGH BULK DENSITY — Another unique advantage of the "Spray Drying Method" is a product of unusually high bulk density. For buyers who have storage problems, or who enjoy "incentive loading" freight rates, or who use covered hopper cars, there are substantial savings in the use of SPRAY-SATIN.

EASY MAKE-DOWN—Before the slip enters the final spray drying process a dispersant is added. You will find that SPRAY-SATIN will go into suspension almost immediately . . . make-down time is dramatically reduced.

Edgar Division

METUCHEN, NEW JERSEY

MINERALS & CHEMICALS CORPORATION OF AMERICA

Try a sample run of SPRAY-SATIN in your own plant . . . the product will prove itself.

EDGAR DIVISION, 8 STATION PLACE, METUCHEN, NEW JERSEY
MINERALS & CHEMICALS CORPORATION OF AMERICA
Please send me, without obligation, sample as checked ⬡ 2 lb. ⬡ 5 lb. ⬡ 10 lb.

Name _____

Company _____

Address _____

City _____ Zone _____ State _____

HORTON STEEL TANK

From water and raw material storage to finished products, there's a Horton® welded steel tank for every pulp and paper mill need. Fuel oil tanks, like the 55,000-bbl. structure shown above, elevated water tanks, chip tanks, blow tanks, pulp tanks and liquor storage tanks are all an every day matter with the Chicago Bridge & Iron Company.

In addition to standard and special storage tanks, CB&I also designs, fabricates and erects digesters, Marx Savealls, Conkey Evaporators and other steel plate structures that enter directly into the processing of pulp and paper mill products. Four strategically located plants are equipped for X-raying, stress-relieving and include facilities for pickling and painting steel plate work.

Write our nearest office for estimates or quotations the next time you are in need of welded steel plate structures of any sort. There is no obligation on your part.

CHICAGO BRIDGE & IRON COMPANY

Atlanta, 3.....2143 Healey Building
Birmingham, 1.....1511 North 50th Street
Boston, 10.....1026—201 Devonshire Street
Chicago, 4.....2445 McCormick Building
Cleveland, 15.....2267 Midland Building
Detroit, 26.....1566 Lafayette Building
Houston, 2.....2143 C & I Life Building
Los Angeles, 17.....1599 General Petroleum Building
New York, 6.....3350—165 Broadway Building
Philadelphia, 3....1653—1700 Walnut Street Building
Pittsburgh, 19.....3231 Alcoa Building
Salt Lake City, 4.....527 West 17th South Street
San Francisco, 4.....1547—200 Bush Street
Seattle, 1.....1327 Henry Building
Tulsa, 3.....1651 Hunt Building

Plants in BIRMINGHAM, CHICAGO, SALT LAKE CITY, and GREENVILLE, PA.

In Canada: HORTON STEEL WORKS LIMITED, FORT ERIE, ONT.

"You see POWELL VALVES everywhere!"

Not surprising when you realize that Powell makes more kinds of valves and has probably solved more valve problems than any other organization in the world. And this has been going on since 1846.

Wherever flow requires dependable control, there's the place for Powell Valves—available through distributors in principal cities. Made ⅛" to 30" and 125 pounds to 2500 pounds W. S. P. Bronze, iron, steel and corrosion resistant alloys. On problems, write direct to The Wm. Powell Company, Cincinnati 22, Ohio.

CONTROLS FOR THE LIFE LINES OF INDUSTRY

Powell Valves

108th year

NEW

DISTINCTIVE

PACKAGING

Huyck papermakers' felts are baled in kraft paper and heavy burlap, assuring clean, safe delivery.

Textile compressive shrinkage blankets are shipped in sturdy, easily stored fibre board drums. The use of a paper product container for shipping felt is a recent development and another *Huyck First*.

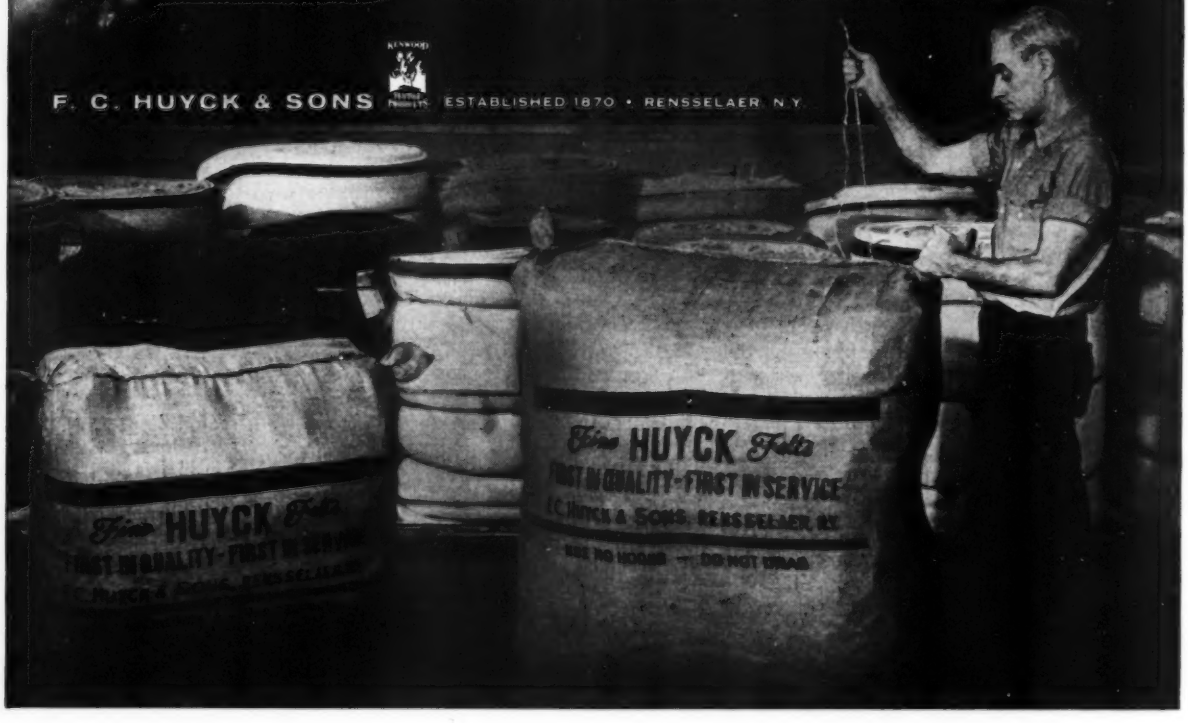
Now, as a further convenience, each Huyck package is clearly labeled in color, for immediate identification, to keep your stand-by Huyck felts ready for instant use.

Consider service carefully when you buy felts: it must always be complete and dependable. As the Huyck service record proves, Huyck felts —with Huyck service—mean better production and lower costs for you.

Now being issued—Vol. II HUYCK FELT BULLETINS. Where shall we send your copies?

HUYCK FELTS
first in quality...
first in service

F. C. HUYCK & SONS ESTABLISHED 1870 • RENSSELAER N.Y.



Regulate Surface Density

KELSIZE KELGIN

and

Control surface density by applying a 0.20% to 3.5% solution of KELSIZE or one of the KELGINS at calender stack or size press.

You secure all four of these outstanding advantages:

1. Improved smoothness and finish
2. More uniform printing surface
3. Greater wax, oil and varnish resistance
4. Better coating surface

Contact our nearest regional office for technical service regarding your sizing problems.

KELSIZE® and **KELGIN®**. . . products of **KELCO** company
31 Nassau Street, New York 5, N. Y.
20 N. Wacker Drive, Chicago 6, Ill.
530 W. Sixth Street, Los Angeles 14, Calif.
Cable Address: Kelcoalgin — New York

Picture of "Vanceometer" Oil Absorption Tester courtesy of Hillside Laboratory, Hillside, Ill.

value in a fine product

reflects the experience and skills of its makers.

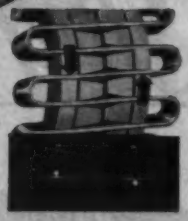
value in Fourdrinier wires is a matter of record ... paper quality and production records in mills throughout America reflect the fact that Appleton Wires are Good Wires!

APPLETON WIRE WORKS, INC., APPLETON, WISCONSIN

• Any size • Any service
• Any application • Horizontal or vertical • Always available

Exclusive FALK Steelflex grid-groove design smothers shock and vibration.

The damaging effects of shock and vibration can shorten the life of any connected machinery. Here is how the Steelflex grid-groove design overcomes these common enemies.



Under LIGHT LOADS
The gridmember bears only at outer edges of grooves. The long span between points of contact remains free to flex under load variations.

Under NORMAL LOADS
As load increases, the distance between supports on the grooves is shortened proportionately, but a free span remains to cushion shock loads.

Under SHOCK LOADS
Under extreme overloads, the grid-member bears fully on the grooves and transmits full load directly. The coupling remains flexible, within its rated capacity.

Why FALK Steelflex Couplings give the *finest* protection for connected machinery

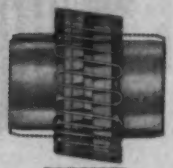
Maximum protection of connected machinery is best provided by Falk Steelflex Couplings because, thanks to their exclusive design, they overcome the damaging conditions of shock loads, shaft misalignment and vibration. How this unique multiple protection is made possible is shown at the right.

Falk Steelflex Couplings give the most economical protection, too, because they make connected machinery last longer and give better service. Furthermore, when actual coupling costs are figured per year of service, Falk Steelflex Couplings show substantial savings through their rugged all-steel construction, easy interchangeability and low maintenance requirements.

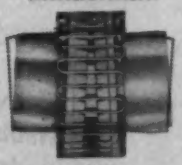
The basic Type F Steelflex Coupling—in 33 sizes to cover capacities from 2/5 through 70,000 hp per 100 rpm—meets over 90% of all industrial applications. Special or Dual Purpose Steelflex Couplings are available for problem applications. Write to Department 247 for engineering bulletin, including selection and dimension details.

...Accommodates shaft misalignment and free end float

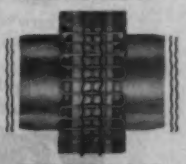
Basic maintenance procedure dictates regular inspection and correction of shaft alignment. Between inspections, Steelflex couplings provide protection by accommodating unavoidable shaft misalignment and end float. The gridmember which connects the two hubs of a Steelflex coupling is not fastened to either hub, so each hub can shift without imposing load on the other shaft.



PARALLEL MISALIGNMENT



ANGULAR MISALIGNMENT



FREE END FLOAT

THE FALK CORPORATION, Milwaukee 8, Wisconsin

MANUFACTURERS OF

- Motoreducers
- Speed Reducers
- Flexible Couplings
- Shaft Mounted Drives
- High Speed Drives
- Special Gear Drives
- Single Helical Gears
- Herringbone Gears
- Marine Drives
- Steel Castings
- Weldments
- Contract Machining

FALK

...a good name in industry

No Slag foothold here

As shown above, the entire superheater of the C-E Recovery Unit is located directly above the furnace. Thus chemical ash deposits, as they are dislodged from the superheater surfaces, fall directly to the furnace hearth.

Accumulation of slag on superheater tubes means trouble in any boiler. In a chemical recovery unit, fired with black liquor having a high percentage of low fusion temperature ash, slag accumulation can be particularly troublesome. With the conventional type superheater slag builds up and anchors itself around individual tubes, insulates them against heat transfer, blocks gas passage, increases draft loss and necessitates mechanical and manual cleaning.

The panel type superheater, found only on the C-E Recovery Unit, allows slag no such foothold. Each element — or panel — of the superheater consists of a solid wall of tangent tubes with wide spacing between panels. The space between individual tubes has been eliminated, so that any slag accumulation is confined to the wall-like surface of the elements where much of it frees itself and the rest is easily dislodged.

This panel construction channels gas flow smoothly over the superheater surfaces and slag formation is, therefore, reduced to a minimum. Furthermore, since slag cannot key-up between tubes, the action of the soot blowers is much more effective.

Developed by, and exclusive with C-E, the panel type superheater represents another significant achievement which has resulted from Combustion's consistent efforts *"to make good equipment better."*

C-E

COMBUSTION ENGINEERING

Combustion Engineering Building • 200 Madison Avenue, New York 16, N. Y.

B-775

BOILERS, FUEL BURNING & RELATED EQUIPMENT; PULVERIZERS, AIR SEPARATORS & FLASH DRYING SYSTEMS; PRESSURE VESSELS; AUTOMATIC WATER HEATERS; SOIL PIPE

When Papermaking Was the Newest Industry Under the Sun...

In the second century after Christ, when papermaking was in its infancy, macerated fibers in liquid form were poured on cloth moulds and placed in the sun to dry. The fiber was stripped from the mould after it was completely dry . . . and thus a sheet of paper was made. In America, modern high-speed machines have taken the place of ancient papermaking methods. And for more than 30 years A. E. Staley Manufacturing Company has served the progressive American paper industry, supplying high-grade raw materials to the nation's leading mills. Staley products and expert assistance can improve *your* business. Contact your supplier or write direct for details.

Quality Staley Products for Papermakers

Staley Sizing Starches
A full range of starches and dextrins for beater, surface or calender sizing.

Staley Corrugating and Laminating Adhesives
Corrugating starches, special laminating and bag adhesives.

Staley Coating Adhesives
Starches and Dextrins give better results for machine or regular brush coating.

Staley Plasticizers
"Sweetose" and Staley's corn syrup are ideal softening agents for glassine paper.

PRODUCTS FROM CORN
Staley's

A. E. Staley Mfg. Company, Decatur, Ill.

Tube Selection Cannot be Reduced to a Formula

—even a complicated one

Selection of the proper grade of stainless steel for a particular application is a relatively complex problem and involves manufacturing, metallurgical, chemical and economic considerations. Although it is complex it has been made easier by industrial research. Data accumulated through years of research and experience gained in helping to solve varied application problems are now available to guide the user in the solution of his present problems.

It is practically impossible to list all the media in which stainless steels will resist corrosion. It is even more difficult to enumerate all the conditions under which the stainless steels will resist effectively the corrosive effects of such media. Frequently, a relatively minor contaminant, when combined with the main reagent, will cause a more detrimental corrosive action than the latter by itself. This is particularly true of iron salts which, in the presence of chlorides, often prove to be a very potent corrodent, producing pitting.

It is always advisable to test a sample under actual operating conditions, especially before extensive untried installations are made. Proper tube selection starts with expert opinion, available to you through Mr. Tubes, your nearby B&W Tube Representative. There is no substitute for the kind of experience with pressure tubing problems you'll find at B&W. Ask Mr. Tubes for help in matching tubes to jobs.

THE BABCOCK & WILCOX COMPANY
TUBULAR PRODUCTS DIVISION
Beaver Falls, Pa.—Seamless Tubing; Welded Stainless Steel Tubing
Alliance, Ohio—Welded Carbon Steel Tubing

B&W SEAMLESS and WELDED TUBES

TA-4061(P)

BETTER PAPER THROUGH HERCULES CHEMICALS

For high wet-strength at an economical cost, more and more paper and board mills are specifying Hercules Kymene.®

Ready to use, easy to handle, Kymene is available promptly no matter where you are located. This popular cationic urea-formaldehyde resin has excellent stability in dilute solutions and has been proving its value wherever used.

For additional details on Kymene wet-strength resin or other paper-making chemicals, contact your local Hercules technical representative. Or write Hercules for descriptive booklet.

PRE-PASTED WALLPAPER—This new and novel "do-it-yourself" way to hang paper is gaining fast in popularity. Pre-pasted paper relies on Kymene to retain its strength when immersed in water prior to application. Whenever you need wet-strength, specify Kymene.

CONSTANT RESEARCH—Typical of Hercules paper-making research facilities is this laboratory at Wilmington, Delaware, where thousands of samples of paper are tested under varying conditions of use. These facilities are available in helping solve your problems.

QUICK DELIVERY—Produced at Hercules plants in Savannah, Georgia, and Mansfield, Massachusetts, Kymene, like all Hercules' paper-making chemicals, is readily obtainable from storage facilities located strategically from coast-to-coast.

Paper Makers Chemical Department

HERCULES POWDER COMPANY

INCORPORATED

961 King Street, Wilmington 99, Delaware

9954-6

Greater production of corrugated board ...less waste

with GLOBE Corn Starch

A stronger board with excellent bond is produced when you use Globe Starch. It yields low spread figures because Globe Starch does not stick to metal, the adhesive can be run the full width of the medium, thereby reducing trim waste. When heating facilities are available, speed can usually be increased 10% to 20% over speeds used with other adhesives. Globe is preferred because...

- *high viscosity types are available*
- *it has stable viscosity in circulation*
- *it has increased adhesiveness*

Ask our man for further details and free technical information. Write

CORN PRODUCTS REFINING CO.
17 Battery Place, New York 4, N. Y.

GLOBE®
brand
CORN STARCH
"Always available"
There is a Globe Starch to meet your every need.

Contemplating Colored Kraft?

National Technical Service can save you costly time-consuming experiments in your mill by providing practical "know how" on coloring kraft, based on current laboratory work and our backlog of "on the job" experience.

National Technical Service laboratories are at your service to develop workable, economical formulas for your color line. Our paper technicians can duplicate "samples to match," and thus assist you in getting your share of the growing market for colored kraft papers and board.

To start "one jump ahead" on a colored kraft line, we invite you to use National Technical Service.

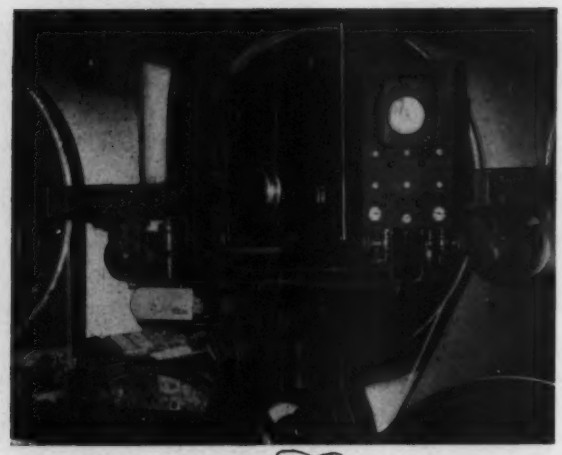
NATIONAL PAPER DYES

STICKLE NEWS

Stickle Equipment
Cuts the cost of steam

Published by Stickle Steam Specialties Co., 2215 Valley Ave., Indianapolis 18, Indiana

New Control Maintains Moisture Content Within ½ of 1%



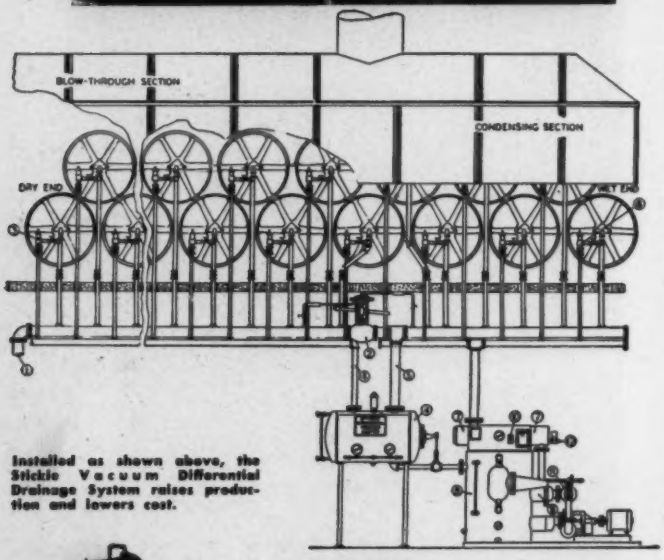
Records and Indicates Moisture Variation of Sheet and Steam Pressure in Dryers

The new Stickle Pres-Ten-Trol automatically maintains the exact moisture content desired in any type of paper or paper board. It regulates steam flow to the dryers — to increase or decrease drying rate — in accordance with variations in moisture content of the sheet passing over the dryers, regardless of normal variations in machine speed or weight of the sheet.

Under actual operation in a 24-hour test on a 33-lb. 24 x 36 500-basis sheet, the unit held moisture content within 3/10 of 1%.

The system is described in free bulletin 360-C, now available from Stickle.

• • •



Installed as shown above, the Stickle Vacuum Differential Drainage System raises production and lowers cost.

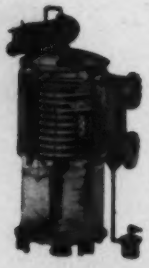
Drainage System is Guaranteed to Cut Paper Mill Steam Costs

The Stickle Vacuum Differential Drainage System cuts fuel costs 10 to 15% by quickly freeing dryers of condensate and air, permitting them to operate at highest efficiency.

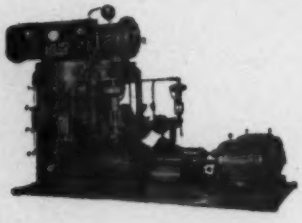
Besides saving steam, the system returns condensate to the boiler room at a higher temperature, thus reducing the cost of steam two ways. The system may be used on paper machines operating at medium and low pressures, and on vacuum.

Included in the system are three of the units shown below — vacuum pump, automatic differential valve, and visible micro adjustable orifice.

Details on the system appear in free bulletin No. 260, available from Stickle on request.



"X-Ray" view of the Stickle Open Coil Deaerating Feed Water Heater . . . guaranteed to heat more water to higher temperature in less space than any other heater at any price. Capacities: 3,000 to 300,000 pounds per hour.



The Stickle Vacuum Pump is main unit of the Vacuum Differential Drainage System. Single and duplex models. Capacities up to 300 GPM (water) and 290 CFM (air); or 900 GPM (water only).

Stickle Visible Micro Adjustable Orifice permits accurate modulated temperature control on dryers with visible operation. Eliminates steam losses due to excessive "blowing through" into return lines.

Stickle Automatic Differential Valve controls exact differentials in pressure between two sections of paper machine, assuring proper drainage at all pressures.

Carry the load via Link-Belt belt conveyors... SEE YOUR COSTS GO DOWN

LINK-BELT offers you the "total engineering" so necessary for top efficiency

DESIGNED FOR OVERALL EFFICIENCY

Because of its unrivalled experience, Link-Belt can do a better job of gathering and analyzing all data. Proposals reflect this understanding of the most practical way to fit conveyors into your overall system requirements.

BUILT FOR LONG-LIFE PERFORMANCE

Link-Belt manufactures all components and related feeders and conveyors. You are assured of the right equipment because of this breadth of line. And Link-Belt will supply the highest grade belts engineered to the job.

DELIVERS FULL RATED CAPACITY

Link-Belt follows through on every detail of the job, including electrical controls and even wiring and foundations. What's more, Link-Belt will furnish experienced erection superintendents, staffs and skilled crews if desired.

ASSURE SATISFACTORY PERFORMANCE

When you rely on Link-Belt as a single source for your complete system, Link-Belt accepts responsibility for placing it in full operating readiness. We will also supervise modernization of existing systems.

Enough chips ride this Link-Belt belt conveyor to produce 250 tons of kraft paper per day. Maximum chip capacity results from use of 45° belt idlers.

WHETHER it's a single belt conveyor or a complete system, there's no substitute for Link-Belt equipment and Link-Belt engineering. Call the district sales office near you for all the facts on this unique single-contract service.

LINK-BELT

BELT CONVEYOR EQUIPMENT

LINK-BELT COMPANY: Executive Offices, 307 N. Michigan Ave., Chicago 1. To Serve Industry There Are Link-Belt Plants and Sales Offices in All Principal Cities. Export Office, New York 7; Canada, Scarboro (Toronto 13); Australia, Marrickville, N.S.W.; South Africa, Springs. Representatives Throughout the World.

11.469-A

HYDRAULIC-OPERATED

Yarway Digester Blow Valve—one of six installed at large North Carolina paper mill.

MOTOR-OPERATED

Yarway Digester Blow Valve—one of eight installed at large Canadian paper mill.

You can choose between hydraulic-operation and motor-operation when you specify Yarway Digester Blow Valves. Both combine all the following Yarway advantages:

- Remote control, usually from above, on the operating floor.
- Tight shut-off. Effective sealing under full digester pressure. Saves cooking liquor. Insures thorough pulp cooking.
- Free discharge. No pockets. Full discharge with minimum pressure drop. Digester blows clean.
- Rugged construction. Built to withstand shock and wear of toughest service.
- Modern metallurgy—such as sliding plunger of hardened stainless steel and sleeve of chromium nickel—resists wear and chemical action.

For full details, write for Yarway Bulletin B-440.

YARNALL-WARING COMPANY
149 Mermaid Avenue • Philadelphia 18, Pa.
Branch Offices in Principal Cities

DIGESTER BLOW VALVES

*"Milk in your paper just won't do, Let **Ti-Pure** whiten it for you!"*

Mill owner Samson was all in a stew,
Dark, dingy paper was making him blue.
His pulp was, at best, a sad dreary lot,
Till TI-PURE of DU PONT arrived on the spot—

"Throw out that milk, Sam, don't be a back-seater!
It's good-by to dark paper, with me in your beater.
Like all Du Pont pigments, I've been put to the test,
As a filler for paper, I'm considered the best!"

Now Sam uses TI-PURE—he's oft heard to say,
"My paper's the whitest in many a day."

MORAL:
Why you should use TI-PURE is quite plain to see:
It gives whiteness . . . and brightness . . . and opacity!

• • •

Du Pont now offers a direct-to-you field service on TI-PURE titanium dioxide pigments. Technical experts, backed by a modern paper laboratory, will be glad to help you with your pigmenting problems. Call our nearest office for details.

PI-94

PROMPT, NATION-WIDE SERVICE THROUGH THESE DU PONT DISTRICT OFFICES* AND WAREHOUSES:

Atlanta, Ga.	Indianapolis, Ind.	*New York, N. Y.
*Chicago, Ill.	Kansas City, Mo.	*Pasadena, Calif.
*Cleveland, Ohio	Lockland, Ohio	*Philadelphia, Pa.
Dallas, Texas	Louisville, Ky.	*Portland, Ore.
Detroit, Mich.	*Malden, Mass.	St. Louis, Mo.
*Houston, Texas	Minneapolis, Minn.	*San Francisco, Calif.
	New Orleans, La.	Seattle, Wash.

DU PONT

Ti-Pure®
TITANIUM DIOXIDE

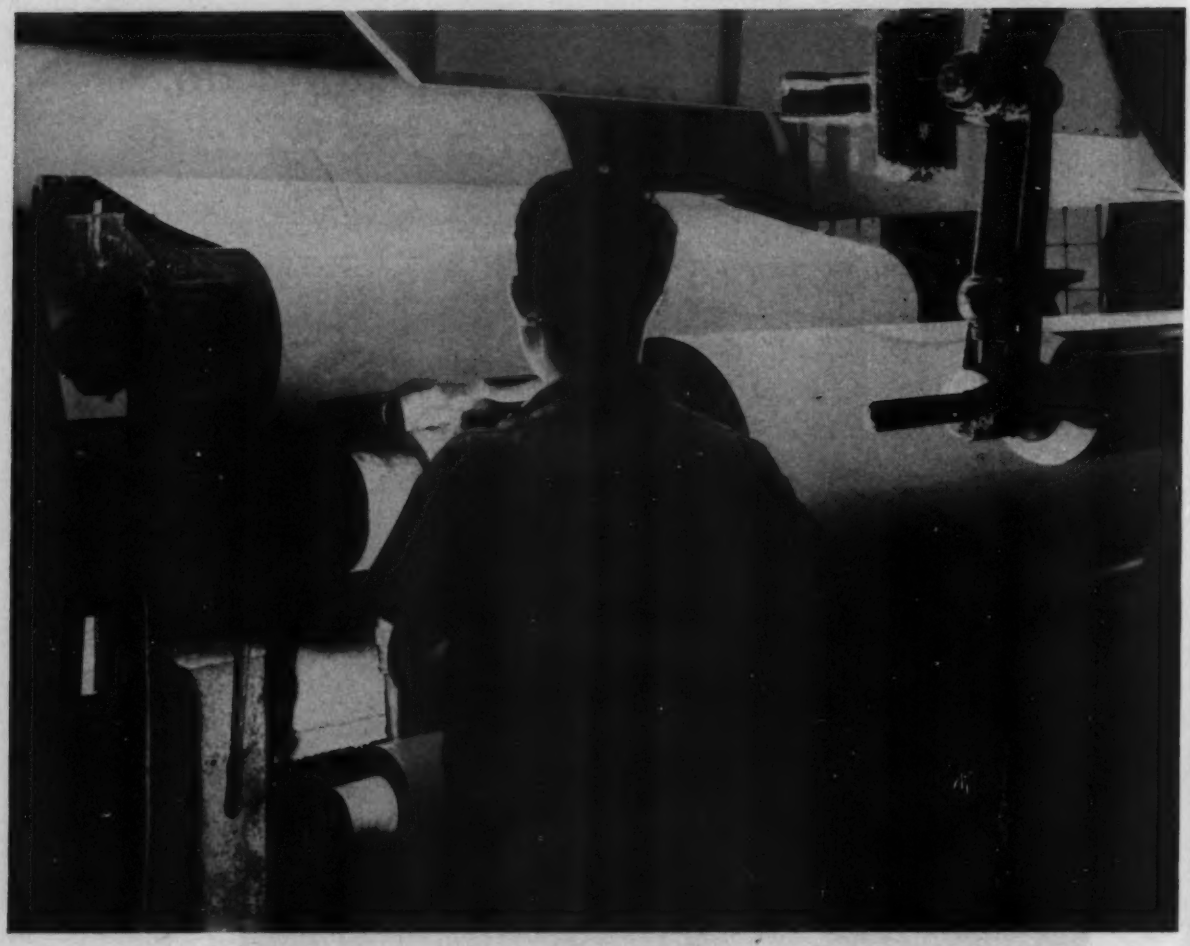
BETTER THINGS FOR BETTER LIVING . . . THROUGH CHEMISTRY
E. I. DU PONT DE NEMOURS & CO. (INC.), PIGMENTS DEPARTMENT, WILMINGTON 98, DELAWARE

TI-PURE gives your paper:

WHITENESS. Lasting whiteness in food wraps and containers, waxed board, glassine, and parchment.

BRIGHTNESS. Permits sharp reproduction of printed matter in porous papers, such as magazine and book stock.

OPACITY. No "show-through" in lightweight papers, envelope and stationery stock.



In PAPER *and Chemicals*
IT TAKES BOTH
FINE MATERIALS AND KNOW-HOW

SOLVAY's position as a leading supplier of chemicals to the paper industry is the result of having provided not only materials of the highest quality . . . but also skilled technical assistance in the use of these products. For in addition to paper chemicals that have set a standard for over 73 years, SOLVAY offers the facilities of the section of their Technical Service Department that specializes exclusively in paper.

Over the years, the engineers and technicians of SOLVAY's Technical Service Paper Section have acquired a vast knowledge and experience. They have at their disposal extensive laboratory facilities and equipment devoted solely to paper processing and testing, in addition to the general organization and equipment of the world's largest alkali research laboratories. This combination of knowledge, experience and specialized laboratory equipment has made it possible for our Paper Section to supply assistance on both technical and production problems, at various times over the years, to most of America's leading papermakers.

SOLVAY makes no charge for services of this kind. It is simply one of the service dividends that go with the purchase of SOLVAY paper chemicals.

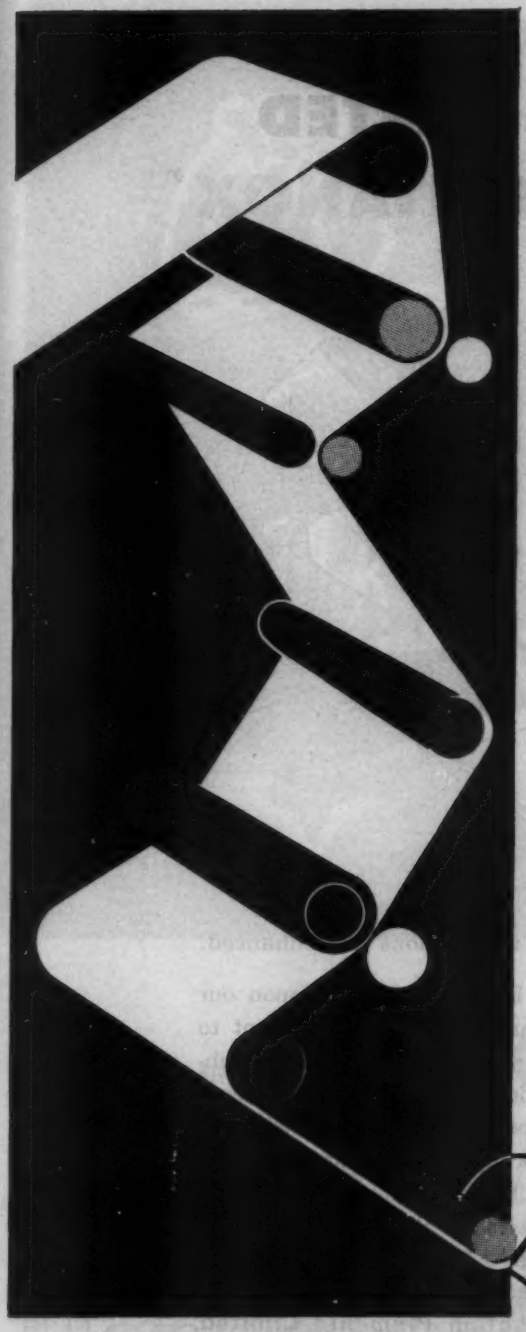
SOLVAY PROCESS DIVISION

Allied Chemical & Dye Corporation
61 Broadway, New York 6, N. Y.

BRANCH SALES OFFICES:
Boston • Charlotte • Chicago • Cincinnati • Cleveland • Detroit
Houston • New Orleans • New York • Philadelphia • Pittsburgh
St. Louis • Syracuse

SOLVAY

SODA ASH
CAUSTIC SODA
LIQUID CHLORINE
CALCIUM CHLORIDE

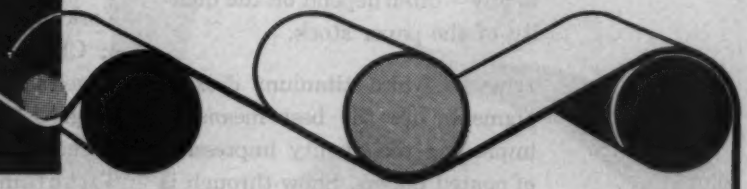


you get
more use per dollar

with **MANHATTAN**
rubber covered rolls

Manhattan Rubber Covered Rolls last longer, reduce machine downtime for replacement, and give you "More Use per Dollar." Manhattan roll covering specialists have developed an inseparable bond of rubber to metal core and a rubber covering that virtually eliminates troubles due to cracking, hardening or corrugating.

You get density custom-tailored to your specific requirements . . . density that stays like new for long, steady production runs. Modern precision roll grinding facilities control accuracy of dimension within .002", giving you "More Use per Dollar" in uniform, trouble-free production quality. Talk it over with the R/M roll specialist.



ROLL COVERING PLANTS AT PASSAIC, N. J. — NEENAH, WIS. — NORTH CHARLESTON, S. C.
MANHATTAN RUBBER DIVISION — PASSAIC, NEW JERSEY

RAYBESTOS - MANHATTAN, INC.

Other R/M products include: Industrial Rubber • Fan Belts • Radiator Hose • Brake Linings • Brake Blocks • Clutch Facings
Asbestos Textiles • Packings • Engineered Plastic, and Sintered Metal Products • Bowling Balls

RM 410

DREAMS LOOK BETTER ON PAPER PIGMENTED WITH TITANOX®

Magazine pages are the builders of many dreams...of fashions, homes, decorations, automobiles and a thousand other things. The best impressions made by the printed page—those that urge the dreamer to buy—often depend on the quality of the paper stock.

TITANOX white titanium dioxide pigments are the best means of improving the quality impression of coated papers. Show-through is minimized, legibility is improved and illustrations are enhanced.

We invite you to call upon our Technical Service Department to help you improve your coated publication papers. Titanium Pigment Corporation, 111 Broadway, New York 6, N. Y.; Atlanta 2; Boston 6; Chicago 3; Cleveland 15; Los Angeles 22; Philadelphia 3; Pittsburgh 12; Portland 9, Ore.; San Francisco 7. In Canada: Canadian Titanium Pigments Limited, Montreal 2; Toronto 1.

2254

®TITANOX

the brightest name in pigments

TITANIUM PIGMENT CORPORATION

Subsidiary of NATIONAL LEAD COMPANY

1849

. . . . Before you look at the package label or at the watermark, take a sheet of L. L. Brown Paper Company's paper between your fingers. Examine it carefully with your eyes—feel it—tear it—give it the pop test—crumple it and hear its lusty crackle. Then let this trade mark confirm the good opinion of your senses.

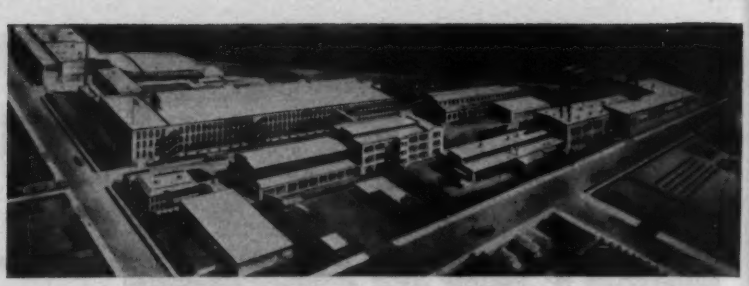
It takes fine felts
to make fine paper.
L. L. Brown Paper Company
is a consistent user of

Hamilton Felts

MIAMI WOOLEN MILLS
Established 1858

SHULER & BENNINGHOFEN, HAMILTON, OHIO

HOOPERWOOD DRYER FELTS



Central Plant, Hooperwood Mills

P PERFORMANCE

D DURABILITY

Q QUALITY

WM. E. HOOPER & SONS CO.

GENERAL SALES OFFICES	Juniper & Cherry Sts., Phila. 7 320 Broadway, New York 7 300 W. Adams St., Chicago 6
HOOPERWOOD MILLS	Woodberry, Baltimore 11

for great cash potential and expense account. Address replies to Box D281 stating age, experience and education.

JOB WANTED

"Cast-iron" back tender* seeks long term employment with leading paper mill. Skilled in maintaining more uniform sheet moisture content and higher average moisture in board or fine paper than most mills believe possible. Knows how to satisfy the superintendent and the management and how to keep customers happy. Strong, steady worker — not subject to ailments. Requires no time off to go fishing. Will work on 90-day trial basis. If employer is not 100% satisfied, will leave quietly without pay. Complete description, photograph, list of accomplishments and references will be submitted on request Address: c/o Armstrong Machine Works, 820 Hoffman Street, Three Rivers, Michigan.

KEY PUNCH

Work in the ... the city

ARMSTRONG MOISTURE CONTROL for PAPER MACHINES

USE THIS HANDY COUPON

(Just clip to your company letterhead and mail)

ARMSTRONG MACHINE WORKS
816 Hoffman St., Three Rivers, Mich.

Please send me Bulletin No. 268 describing the Armstrong Moisture Control.

NAME_____

(Clip to your letterhead and mail)

CHEMICAL USERS' GUIDE To General Chemical Products for the Paper Industry

PRODUCT	AVAILABLE FORMS	COMMERCIAL STRENGTH (MIN.)	SHIPPING CONTAINERS	APPLICATIONS
Aluminum Sulfate $Al_2(SO_4)_3 \cdot 14H_2O$ approx. *(Alum)*	Commercial & Iron Free: Lump, Ground Powdered	17.25% Al_2O_3	Bags Bulk Carloads	Precipitation of rosin size and filler; water clarification; manufacture of satin white; pitch control; mordant for dyes.
Aluminum Sulfate $Al_2(SO_4)_3$ + water *(Liquid Alum)*	Liquid	32° Be (total Al_2O_3 7.2%)	Tank Trucks Tank Cars	Same as commercial dry product but lower strength.
Salt Cake Na_2SO_4	White or Grayish Granules	95-99% Na_2SO_4	Bags Bulk Carloads	Used in kraft cooking liquors as the source of Na_2S.
Glauber's Salt, Crystal $Na_2SO_4 \cdot 10H_2O$ *(Sodium Sulfate)*	Colorless Crystals	96% $Na_2SO_4 \cdot 10H_2O$ (42.3% Na_2SO_4)	Bags Barrels Fibre Drums	Substitute for salt cake in kraft cooking liquor.
Glauber's Salt, Anhydrous Na_2SO_4 *(Sodium Sulfate)*	White Granules	99.9% Na_2SO_4	Bags Bulk Carloads	Same as Crystal but stronger product.
Sulfuric Acid H_2SO_4	Liquid	66° (93.19%), 99% 20% oleum and higher strengths	Carboys Steel Drums Tank Trucks Tank Cars	Wire souring; parchmentizing; acid wash in last stage of multi-stage pulp bleaching; neutralizing tall oil soaps; pH adjusting.
Hydrochloric Acid HCl + water *(Muriatic Acid)*	Liquid	18° Be (27.92%) 20° Be (31.45%) 22° Be (35.21%)	Carboys Tank Trucks Tank Cars	Wet strength paper.
Sodium Bisulfite, Anhydrous $Na_2S_2O_5$ *(ABS) (Sodium Metabisulfite)*	Powder	97.5% $Na_2S_2O_5$ (Equiv. 65.5% SO_2)	Bags Fibre Drums	Anti-chlor.
Sodium Silicate $Na_2O \cdot XSiO_2$ + water *(Water Glass)*	Liquid	38°, 41°, 42° Be; special and higher strengths	Steel Drums Tank Cars Tank Trucks	Adhesive for corrugated and solid fibre board; used in coating mixtures to reduce viscosity and in beater sizing to stiffen paper. Aid in bleaching & flocculation.
Chromium Potassium Sulfate $K_2SO_4 \cdot Cr_2(SO_4)_3 \cdot 24H_2O$ *(Potash Chrome Alum)*	Red Violet Crystals	99.5% $K_2SO_4 \cdot Cr_2(SO_4)_3 \cdot 24H_2O$	Fibre Drums	Used in "save-all" or white water systems.
Aqua Ammonia NH_4OH + water *(Ammonia)*	Colorless Liquid	26° Be (29.4% NH_3)	Carboys Steel Drums Tank Trucks	Used with chlorine to form chloramines for slime control.
Sodium Fluoride	Powder	95% NaF 97% NaF	Multiwall Paper Bags Fibre Drums	Preservative and stabilizer for starch in coating mixtures.
Tetrasodium Pyrophosphate, Anhydrous $Na_4P_2O_7$ *(TSPP) (Pyro)*	White Powder	98% $Na_4P_2O_7$ (Equiv. 52% P_2O_5)	Bags Fibre Drums	Felt washing; pitch dispersion; coating.
Sodium Tripolyphosphate $Na_5P_3O_{10}$ *(Tripoly)*	White Powder	90-95% $Na_5P_3O_{10}$ (Total P_2O_5—56%)	Bags Bulk Carloads	Felt washing; pitch dispersion; coating.
Nitric Acid HNO_3 + water	Liquid	42° Be 67.2% HNO_3	Carboys Drums Tank Trucks	Nitrating pulp; cleaning monel metal.

The products advertised are commercial chemicals having various uses, some of which may be covered by patents, and the user must accept full responsibility for compliance therewith.

OTHER PRODUCTS: Sodium Sulfite; Sodium Thiosulfate; Sodium Metasilicate; Trisodium Phosphate; Copper Sulphate; Disodium Phosphate.

FOR THE LABORATORY OR SPECIAL APPLICATIONS: BAKER & ADAMSON REAGENTS and FINE CHEMICALS

GENERAL CHEMICAL DIVISION

ALLIED CHEMICAL & DYE CORPORATION

40 Rector Street, New York 6, N. Y.

Offices: Albany • Atlanta • Baltimore • Birmingham • Boston • Bridgeport • Buffalo • Charlotte Chicago • Cleveland • Denver • Detroit • Greenville (Miss.) • Houston • Jacksonville • Kalamazoo Los Angeles • Minneapolis • New York • Philadelphia • Pittsburgh • Providence • St. Louis San Francisco • Seattle • Yakima (Wash.)

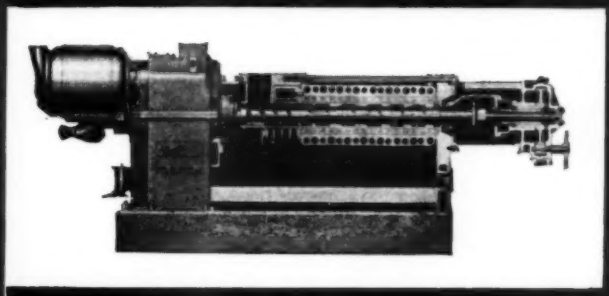
In Wisconsin: General Chemical Company, Inc., Milwaukee, Wis.

In Canada: The Nichols Chemical Company, Limited • Montreal • Toronto • Vancouver

Allied Chemical

THIS *NEW* MACHINE SOLVES PROBLEMS

BAUER PRESSAFINER



A machine like this has never before been used in the pulp and paper industry.

The No. 460 Bauer Pressafiner is essentially a continuous screw press which develops pressures up to 8,000 psi. Materials processed are subjected to alternate twisting and compressive forces. Nobody knows all of its possible applications, but the Pressafiner has demonstrated its ability to perform the following unique operations:

1. Remove fluids from wood chips, agricultural residues, screenings, knots, bark, and pulp.
2. Accomplish preliminary fiberizing of chips and other large fiber aggregates.
3. Mildly cook fibrous materials by means of compaction heat.

These achievements of the Pressafiner pay handsome returns on the investment by removing concentrated liquor, simplifying the problem of stream pollution, reducing water and steam consumption, cutting down power requirements for pumping and refining, improving pulp yield and paper quality, dewatering bark for fuel, and fiberizing raw or steamed chips for board stock refining.

Naturally, you'll want more information on the Pressafiner. So mail the coupon.

Bauer

THE BAUER BROS. CO.

1758 SHERIDAN AVE. • SPRINGFIELD, OHIO

Send me Bulletin No. P-12 on the Pressafiner.

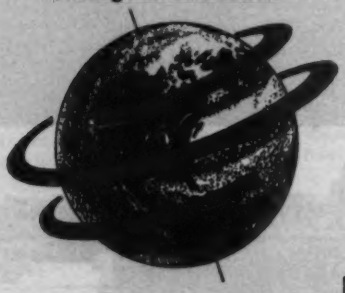
Individual and Title

Company

Street Address or Box

City, Zone, State

Over 750 Installations
in 22 Countries
Throughout the World



Morden-ize

THE 3 BASIC TREATMENTS IN YOUR STOCK PREPARATION

EACH STOCK requires one or more of these basic treatments.

EACH MORDEN MACHINE is engineered, standardized and proven in one of these basic treatments.

EACH MILL'S requirements suggest various applications.

OUR EXPERIENCE in assisting mills to develop simple, effective and economical stock preparation systems is available to you upon request.

MORDEN SLUSH MAKER®
...for completely defibering all pulps, papers and brokes (even wet strength) without auxiliary equipment.

MORDEN STUFF MAKER
... for cutting or shortening where required to obtain specific sheet properties.

MORDEN STOCK MAKER®
...for brushing, fibrillating and hydrating individual fibers for maximum strength development.

MORDEN
STOCK PREPARATION EQUIPMENT
MACHINES COMPANY

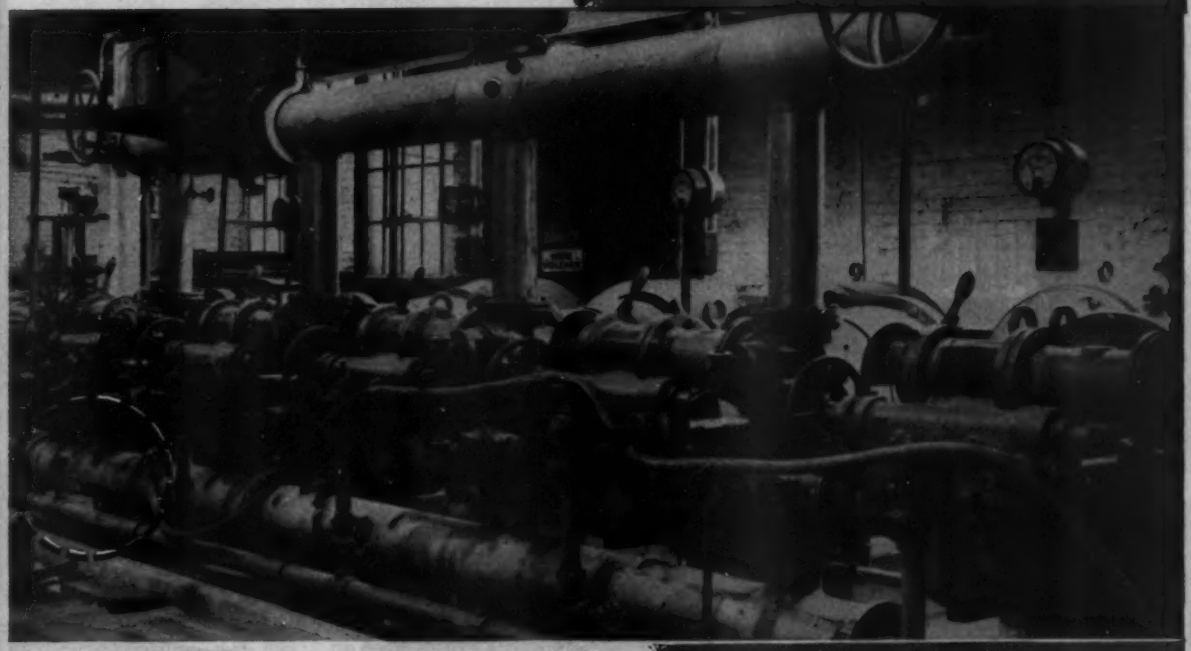
Northeastern States Representatives:
ORTON CORPORATION, Fitchburg, Massachusetts

Midwestern States Representatives:
DAN B. CHAPMAN, Appleton, Wisconsin

Other Representatives in most paper-making countries.

3240 S.W. MACADAM AVENUE PORTLAND, OREGON

Save Time and Money on Corrosion-Resistant Line Assemblies . . .



. . . with TRI-CLOVER Stainless Steel Fittings

Among the most important factors governing the selection of corrosion-resistant fittings, piping and line assemblies are: (1) The assurance of *full* corrosion-resistance in the actual material *and* in the finished assemblies; (2) The assurance that the manufacturer has had ample experience and ability in producing a full range of corrosion-resistant material; and (3) assurance that actual costs for installation will be as low as possible, commensurate with the quality of the finished assemblies.

When you specify *TRI-CLOVER* stainless steel fittings, pipe, tubing and pumps you can be *sure* that all of the above factors have been met . . . And you can be *sure* that you are getting *full* corrosion-resistance in *every* fitting and fitting assembly . . . thanks to Tri-Clover's specialized experience in solving corrosion-resistant piping problems for chemical-process industries from coast to coast.

STAINLESS STEEL CLAMP-TYPE CONICAL FITTINGS . . . requires only two simple ferrules and clamp to assure leak-tight joints thru the use of Teflon gaskets. Fast, simple assembly and disassembly—Just one of the complete range of Tri-Clover Stainless Steel fitting types to meet practically every corrosion-resistant piping requirement.

LADISH CO.
Tri-Clover Division
KENOSHA WISCONSIN

THE Complete Line

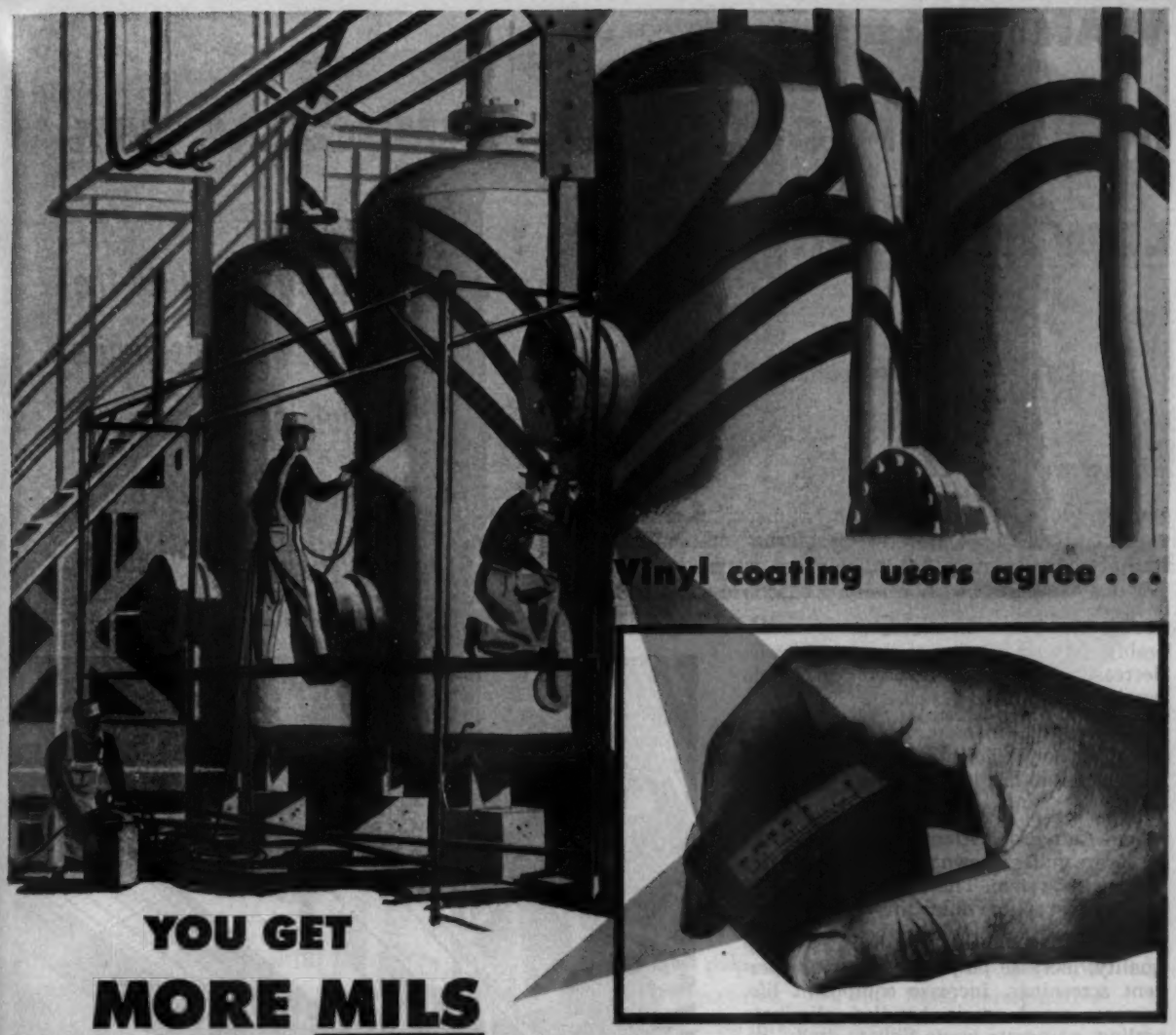
See your nearest TRI-CLOVER DISTRIBUTOR
EXPORT DEPARTMENT, 8 So. Michigan Ave., Chicago 3, U.S.A.

I 354

For ... • DESIGN • FINISH • DEPENDABILITY
• UNIFORMITY • SERVICE

APPLETON WOOLEN MILLS

APPLETON • WISCONSIN



YOU GET MORE MILS PER GALLON WITH AMERCOAT 33

Amercoat's higher solids content gives you a thicker, heavier coating—more mils for every gallon applied.

THIS MEANS YOU SAVE MONEY TWO WAYS ON MAINTENANCE PAINTING

Lower Material Cost. You save on material because it takes fewer coats of AMERCOAT 33 to build the required film thickness.

Lower Labor Cost. You save on labor because fewer coats mean fewer man hours for application–less down time, too.

In addition to more mil thickness per gallon, you get more protection per gallon. AMERCOAT 33 is formulated specifically for maximum chemical resistance and for severe weathering conditions. In major industries from coast to coast – chemical, petroleum, pulp and paper, food, and many others – maintenance engineers look to AMERCOAT 33 for low cost, long lasting protection for all types of steel or concrete structures.

Amercoat pioneered the development of protective coatings especially designed for severe corrosion problems. Today it is the only organization that offers you... a complete line of corrosion resistant coatings...nationwide distribution... trained technical men to give you on-the-job assistance throughout the United States and Canada.

Amercoat CORPORATION
Dept. B,
4809 Firestone Blvd.,
South Gate, California

CHICAGO, ILL. • EDGEWORTH, PA. • JACKSONVILLE, FLA. • HOUSTON, TEX.

Write today for the AMERCOAT 33 Technical Bulletin which gives a complete description of the coating's chemical and physical properties.

WANT TO

INCREASE PRODUCTION AS MUCH AS 25% ?

LOWER PULPING COSTS ?

...then switch to the Ammonium Bisulphite Pulping Process... pioneered by the Nitrogen Division

These are the facts!

Raise Production—Faster and more thorough penetration cuts cooking time by 19% or more, with the same maximum temperatures and pressures, giving that much more production. In addition, the penetrating period with ammonia base is less critical.

Reduce maintenance costs—damage is considerably reduced because of the tremendous decrease in solid and insoluble materials passing through the system.

Save up to 40 lbs. of sulphur per ton of pulp —due to more efficient absorption of SO_2 in ammonium bisulfite solution.

Save the cost of labor and handling of limestone—Anhydrous Ammonia unloads from tank cars under its own pressure piped to an automatic system. There is no waste at all and the cost of lime unloading is eliminated.

Other big advantages: you increase pulp quality, increase pulp yield, decrease percent screenings, increase equipment life, increase wood specie handles, eliminate scaling, evaporate waste liquors easily, reduce stream pollution to a minimum.

Leading mills have converted to the Ammonium Bisulphite Pulping Process because they found pulp production is increased while pulping costs go down.

The changeover to this Pulping Process is inexpensive. A minimum replacement—and in many cases, no replacement—of equipment is involved, and there is practically no loss of production during conversion.

WRITE TODAY!

- Send for full details on the Ammonium Bisulphite Pulping Process.
- Ask for a Technical Service man to call. No obligation!

NITROGEN DIVISION ALLIED CHEMICAL

Anhydrous Ammonia

NITROGEN DIVISION

ALLIED CHEMICAL & DYE CORPORATION
40 Rector Street, New York 6, N. Y.

Ironton, Ohio • Orange, Texas • Omaha, Nebraska

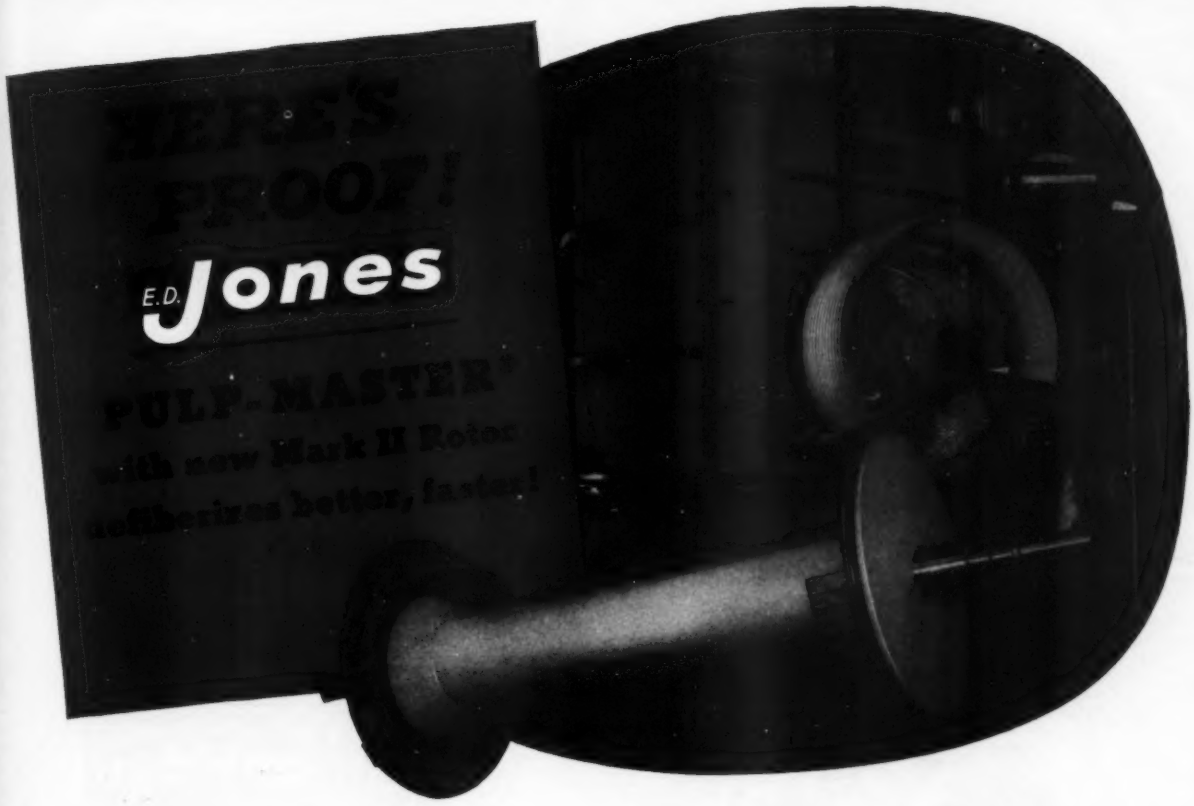
Ammonia • Sodium Nitrate • Urea • Ethylene Oxide • Ethylene Glycol Diethylene Glycol • Triethylene Glycol • Methanol • Formaldehyde Nitrogen Tetroxide • U.F. Concentrate–85 • Nitrogen Solutions Fertilizers & Feed Supplements

s ?

a

e Glycol
ldehyde
olutions

1954



"The results are as good as any we could wish for," says the production manager of a mill making sulphite and sulphate bonds. "We've reduced the horsepower hours for pulping bond broke from 187 to 60."

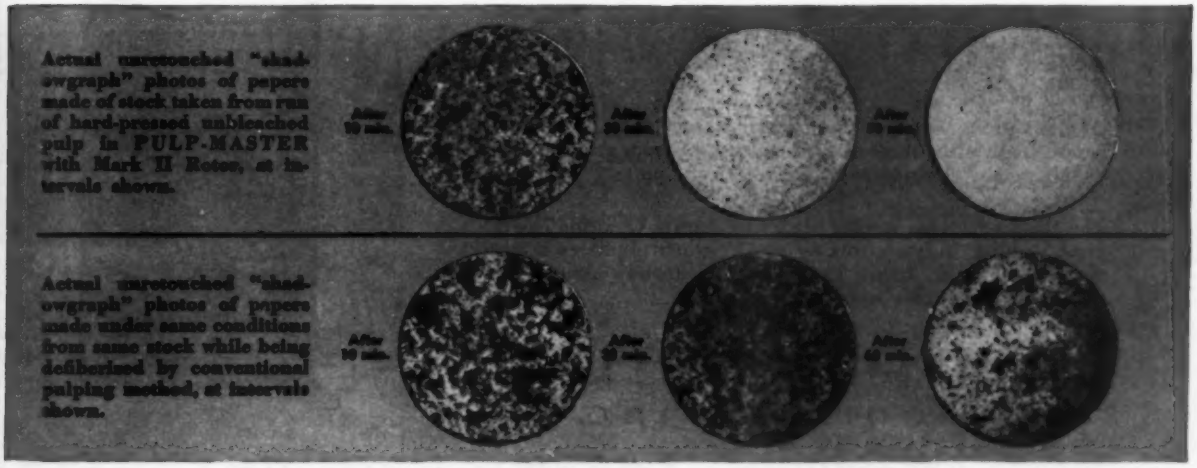
The slides tell the story. Taken from an actual run, under mill conditions, they graphically demonstrate the superiority of the Pulp-Master with the new Mark II rotor over conventional pulping methods.

The Pulp-Master is equally effective on baled pulp, broke, bagasse, waste paper or other material. Ask your Jones representative — or write direct for details.

E.D. Jones

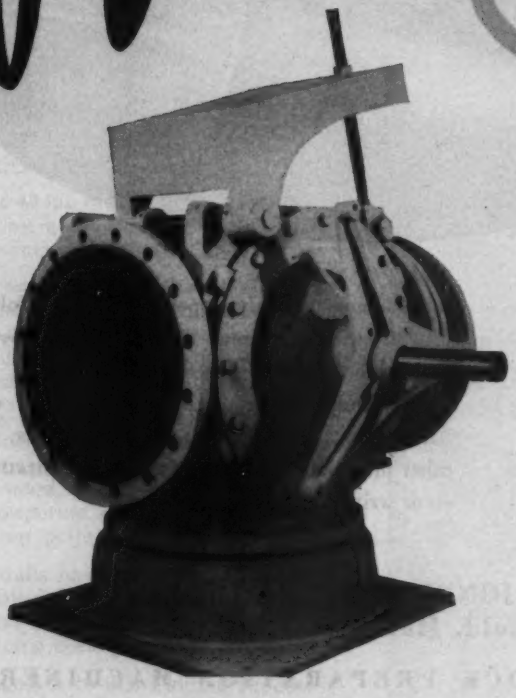
E. D. JONES & SONS COMPANY
Pittsfield, Mass.

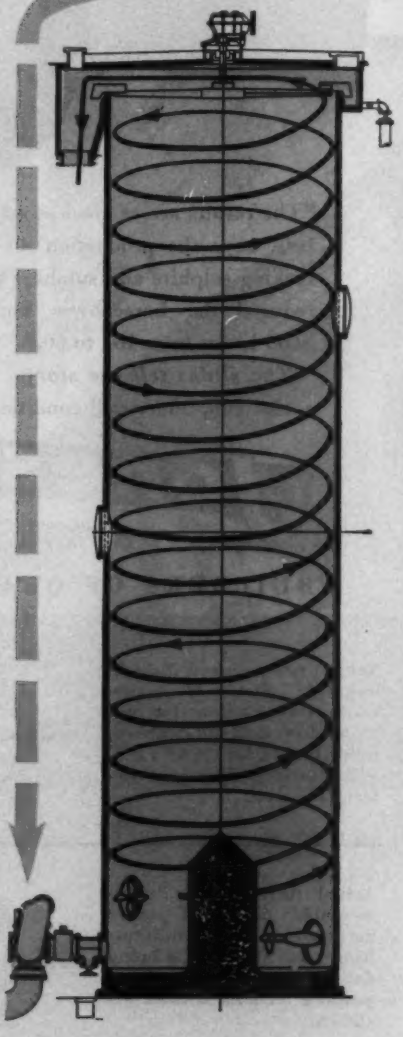
BUILDERS OF QUALITY STOCK PREPARATION MACHINERY


Actual unretouched "shadowgraph" photos of papers made of stock taken from run of hard-pressed unbleached pulp in PULP-MASTER with Mark II Rotor, at intervals shown.
After 10 min.
After 20 min.
After 40 min.
Actual unretouched "shadowgraph" photos of papers made under same conditions from same stock while being defiberized by conventional pulping method, at intervals shown.
After 10 min.
After 20 min.
After 40 min.

Good Bleaching

STARTS HERE





IMPCO CHLORINE MIXER

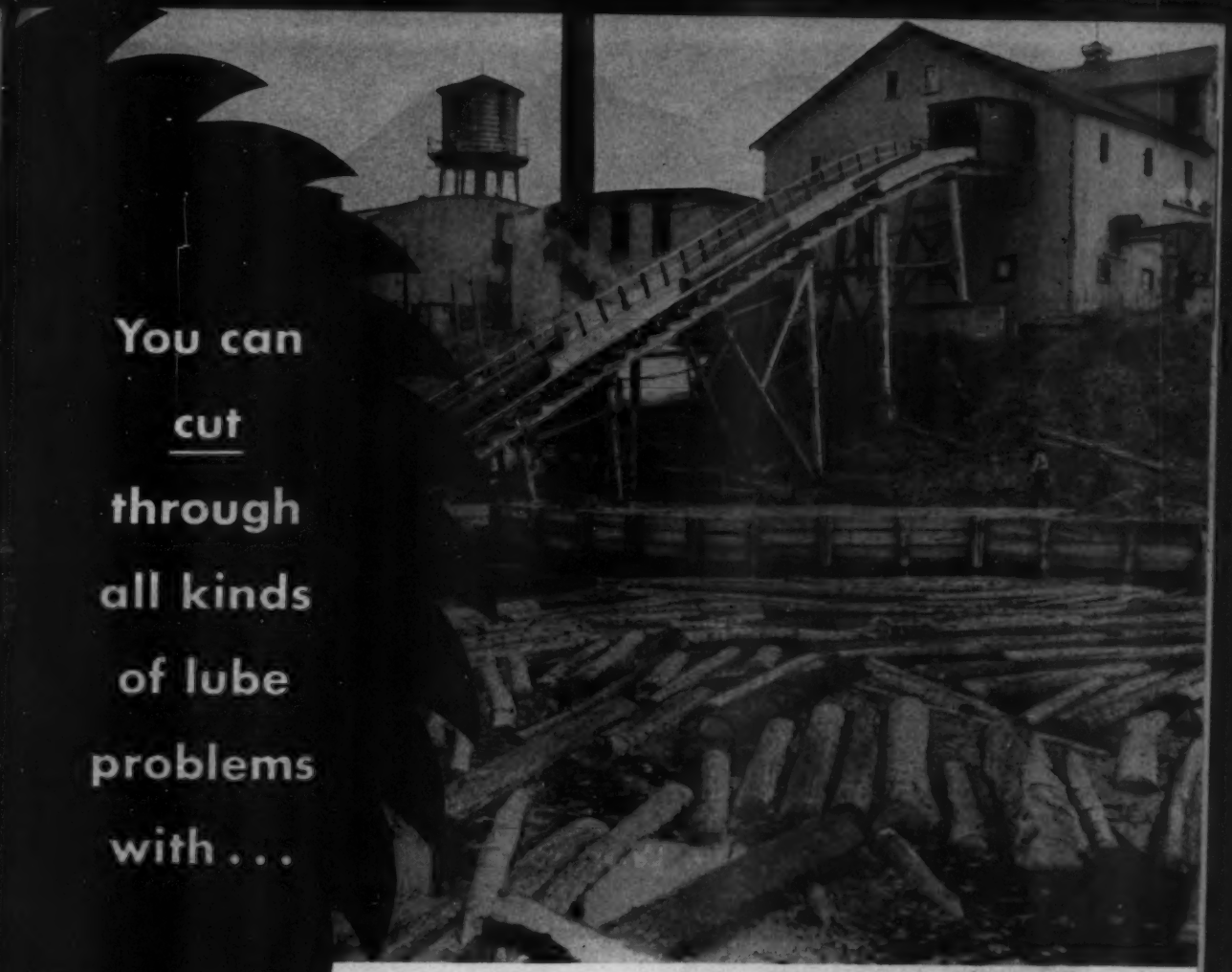
Of the various stages in the modern bleach plant, the chlorination stage is the most difficult to control from a standpoint of mixing the chlorine *completely* with the pulp.

The IMPCO double wabble plate low density Chlorine Mixer gives a quick intimate mixing result which improves retention in the main tower and insures uniformly chlorinated pulp, with significant savings in chlorine.

IMPROVED
MACHINERY INC.

Sherbrooke Machineries Ltd. Sherbrooke, Quebec manufacture similar equipment in Canada.

C3-a



You can cut through all kinds of lube problems with . . .

STANODRIP Dripless Oils

STANODRIP Dripless Oils are particularly suited for use in processing industries (food, rubber, etc.) where possible contamination from oil poses a lubricating problem. If your plant is in the Midwest, there's a trained Standard Oil lubrication specialist nearby who can be of service to you.

● This story about a sawmill describes a problem that is common to many industrial plants. And it tells about a service that solves a thousand and one different problems in the operation of industrial machines.

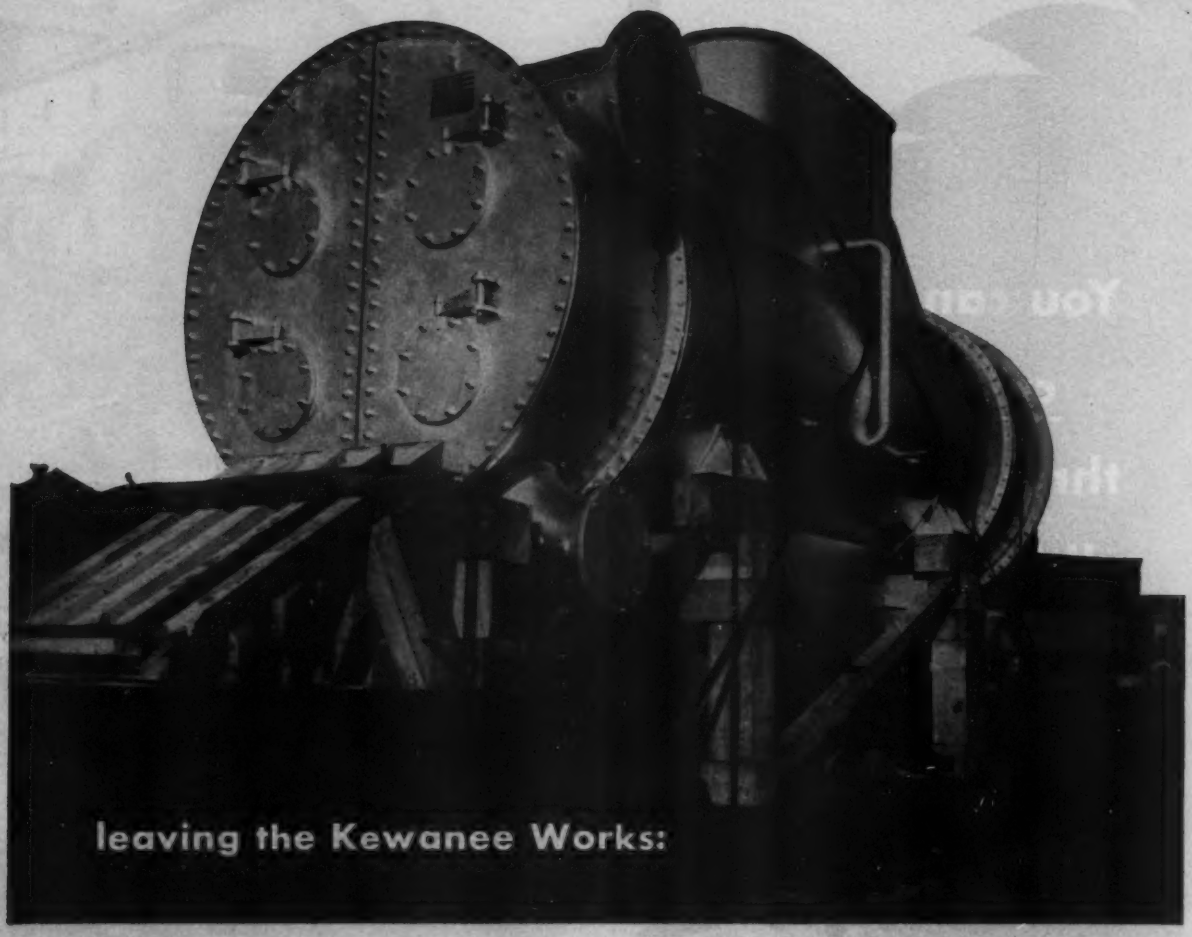
The sawmill pictured above was having trouble with overheated bearings, as well as with high consumption of oil on these particular bearings. In addition, there was excessive dripping of the oil on the floor, creating a safety hazard.

The mill operators asked for the services of the near-at-hand Standard Oil lubrication specialist, C. F. Klenner. He recommended a trial of STANODRIP Oil No. 99, an oil having remarkable dripless qualities and at the same time capable of withstanding high heat.

After a reasonable trial period, inspection revealed that consumption was greatly reduced, bearing temperatures were considerably lower and there were no more oil puddles on the floor. STANODRIP Oil No. 99 was then placed in all line shaft bearings and since then, there have been no bearing failures.

STANODRIP Dripless Oils are part of a complete line of Standard lubricants developed to serve the many machinery lubricating problems of industry. If you want help or information, phone your nearest Standard Oil office or write: Standard Oil (Indiana), 910 S. Michigan Avenue, Chicago 80, Ill.

STANDARD OIL COMPANY STANDARD *(Indiana)*



ROSS SURFACE CONDENSERS TRAVEL TO ALL CORNERS OF THE WORLD

Leaving the Kewanee, Ill. plant, this Ross Surface Condenser is one of a pair bound for New Mexico. It's a relatively short trip compared to the distances that many Ross units have traveled to reach countries such as Australia, Brazil, Iran, Aruba, Sumatra . . . mentioning but a few. Their efficiency and dependability have been proved in remote and isolated locations all over the world.

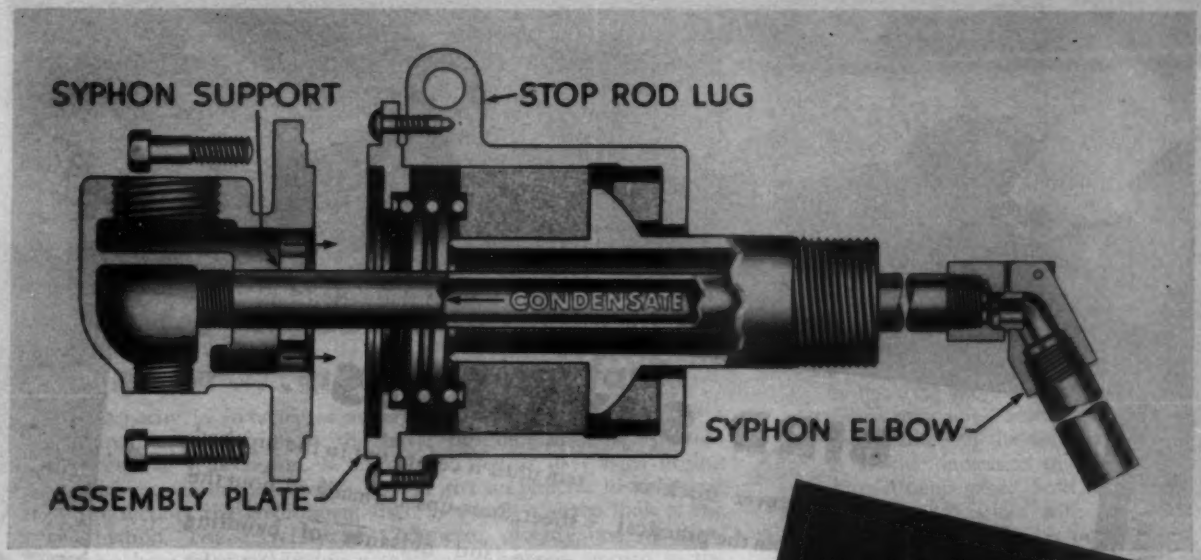
The reason Ross Surface Condensers are widely preferred, for installations both in the U. S. and foreign countries, can be expressed in two words: *advanced engineering* . . . engineering that introduced the first all welded steel surface condenser at Parr Shoals, S. C. in 1929 and pioneered numerous other developments, including Balanced Flow and divided tube bank design.

It's only logical then, that Kewanee-Ross is best qualified to meet *your* surface condenser requirements, too. Consultation with Kewanee-Ross engineers will leave you assured of this.

KEWANEE-ROSS CORPORATION
DIVISION OF AMERICAN RADIATOR & STANDARD SANITARY CORPORATION
1430 WEST AVENUE • BUFFALO 13, N. Y.
In Canada: Kewanee-Ross of Canada Limited, Toronto 5, Ont.

ROSS SURFACE CONDENSERS

Serving home and industry: AMERICAN-STANDARD • AMERICAN BLOWER • CHURCH SEATS & WALL TILE • DETROIT CONTROLS • KEWANEE BOILERS • ROSS EXCHANGERS • SUNBEAM AIR CONDITIONERS



Straightens out a lot of troubles...

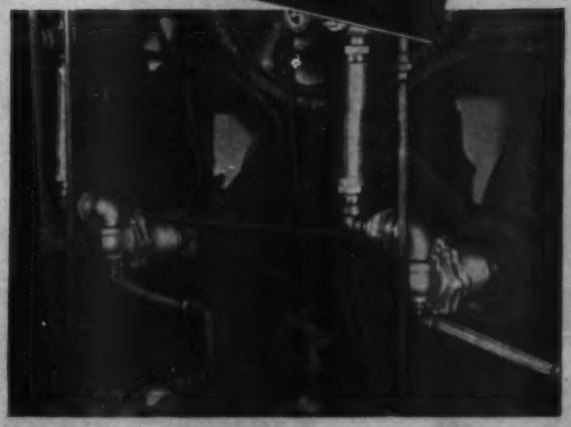
with TYPE SBP

Ordinary curved syphon pipes aren't easy to form in the first place. It's hard work putting them in position, and sometimes tougher keeping them there.

The Johnson Syphon Elbow shown at right above straightens out these difficulties completely. It permits the use of straight pipe for the syphon drainage line. It is hinged to pass in or out of the roll easily, yet seats itself tightly when in position.

Perfect team mate for this syphon elbow is the Type SBP Johnson Joint shown at left in the illustration. It is packless, self-lubricating and self-supporting. It has a special assembly plate which holds internal parts in position when head is removed.

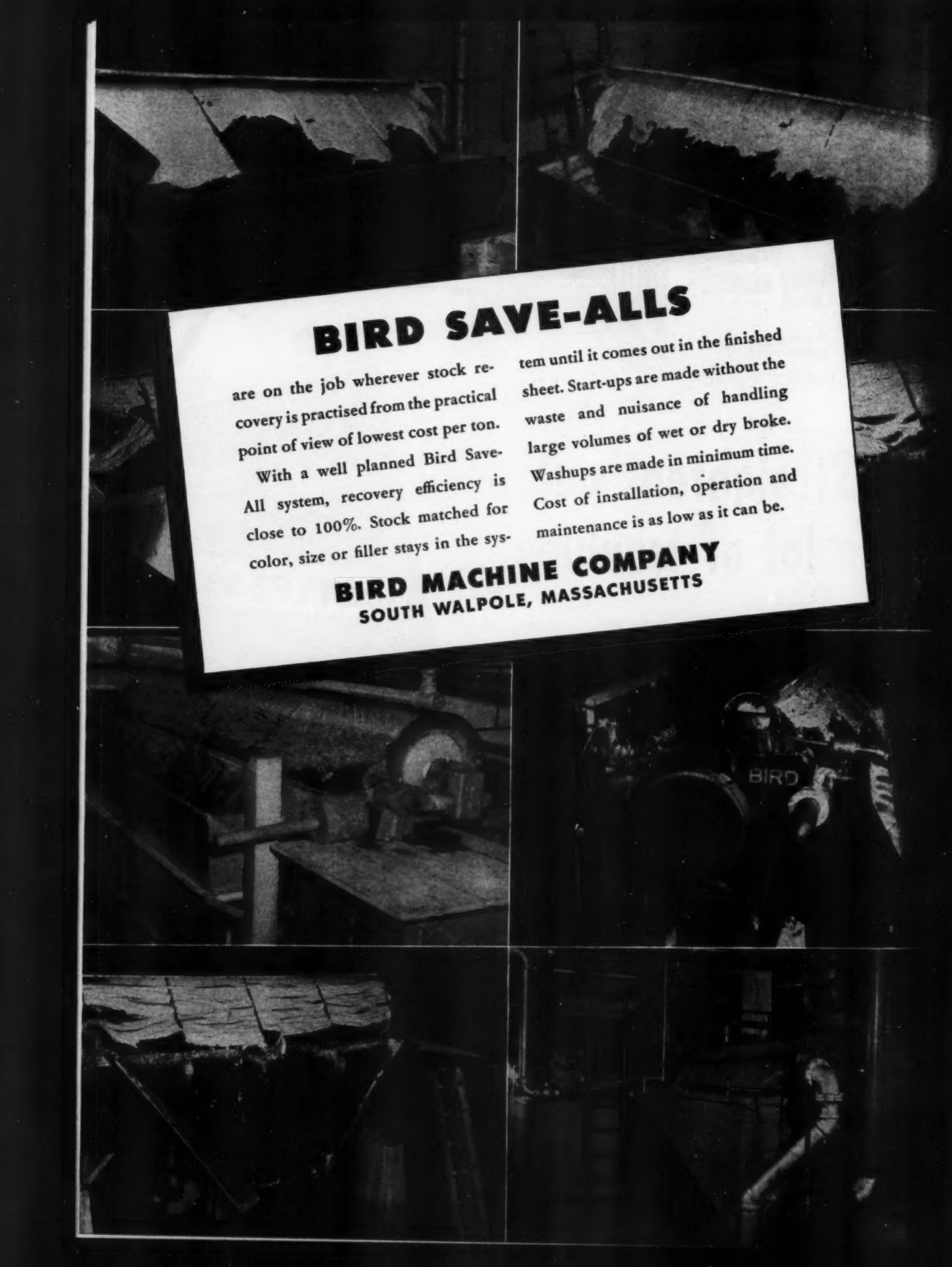
90-day Trial! — Several thousand installations of this new Syphon Elbow have proved it a complete success on paper machines. If you'd like to try it in your own mill, we will be glad to supply a couple of units for a 90 day trial, without any cost or obligation on your part.



Products of The

845 Wood St., Three Rivers, Michigan

Rotary Pressure Joints • Compressed Air Separators and Aftercoolers
Direct Operated Solenoid Valves • "Instant" Steam Water Heaters



BIRD SAVE-ALLS

are on the job wherever stock recovery is practised from the practical point of view of lowest cost per ton.

With a well planned Bird Save-All system, recovery efficiency is close to 100%. Stock matched for color, size or filler stays in the system until it comes out in the finished sheet. Start-ups are made without the waste and nuisance of handling large volumes of wet or dry broke. Washups are made in minimum time. Cost of installation, operation and maintenance is as low as it can be.

BIRD MACHINE COMPANY
SOUTH WALPOLE, MASSACHUSETTS

CURRENT COMMENTS

Hopes for Republican Congress . . . expansion . . . age of consultants

Prosperity in industry as an argument for the re-election of a Republican Congress is the latest program of administration circles at Washington. While top strategists have been urging businessmen to place orders now to give an impetus to industrial production, the government itself is taking a sharp look at the situation. The Secretary of Commerce, already one of those who have been predicting a substantial business upturn in the fall, announced a decision at a news conference to help depressed areas of the economy, particularly in shipbuilding and textiles. Allocations of government contracts are being expedited to develop an improved business atmosphere. Allocations of funds for road construction have been authorized earlier than usual.

This is an outstanding feature of the administration hopes for a return of a Republican Congress in the November elections. However, emphasis will be given to the accomplishments of the present Congress in carrying forward the Eisenhower program to get the nation out of the rut of creeping socialism. With Congress tangled in efforts to clean up the "Ike Program" before adjournment, much of the President's program is being accepted even by those of his own party who have been somewhat tepid in their support of his policies.

While there has been some intra-party opposition, even the stand-pat group of Republicans are beginning to realize that they are better off with a president of the Eisenhower type than an outright return to a Democratic administration. In the long pull, it seems certain that Mr. Eisenhower is achieving some success in unifying the various theories of Republicans from different sections of the country.

Nature doing part of the job

While the administration is carrying foward its plan for a nudge to the economy, nature is doing part of the job itself. The National City Bank of New York has issued a comprehensive tabulation of corporation sales and earnings for the first half of the year. Despite a slight recession from last year's peak, combined income after taxes of 660 companies was 2 per cent higher in both the first and second quarters than a year ago. Reports of 457 manufacturing companies included in the 660-company total show an increase of 7 per cent over 1953, but the average for all is brought down by sharp drops in amusements, service industries and the railroads. Railroad earnings dropped 45 per cent. In the manufacturing field textiles were the weak sisters. Twenty paper and allied products industries, on the contrary, showed an increase of 23 percent, both for the second quarter and for the half year, or far above the over-all industry average.

Tariff revisions defeated

Despite the furor of the advocates of "Trade not Aid," and their demands for radical tariff reductions through Reciprocal Trade Agreements, the administration has salvaged only one minor item of its original program. The Trade Agreement Act was extended for one year only, and efforts to have a radical working over of the entire tariff schedule have failed. Congress merely authorized the Tariff Commission to make an intensive study of the situation but granted no authority to any administrative agency to put any of the recommendations of the Randall Commission into actual effect. "Let's take a look before we leap," has been the slogan of the Congress as a whole. Prolonged studies will be carried on to form a basis for some possible legislation in the next Congress. The efforts to substitute export value for foreign prices as a basis for computing duties have been killed in the Senate. The tariff revision part of the Eisenhower program has been given the Congressional axe more than any other basic plank.

Trends in industry have been taking a new turn during the summer. Extensive plans for expansion are manifest in various major fields, as shown by financing programs of several individual companies. Scott Paper Co. has been leading in the field of mergers, as another indication of a rising industrial temperature. Scott, after some earlier consolidations with other less important companies, is in the news with the outright purchase of Detroit Sulphite, acquisition of half interest of a British Columbia sanitary paper mill, and negotiations for a merger with the old established Hollingsworth & Whitney Co. of Massachusetts and the South. All of these developments reported from time to time indicate real strength in the paper manufacturing field. A typical instance was the report of the Kimberly-Clark Corp., which finds its present capacity is not sufficient to meet its normal customer demand and provide a backlog of surplus capacity to meet abnormal demands for its products. Great Northern has gone over into a broader field after a lifetime devoted almost entirely to newsprint production.

New type industry personnel

The development of a new type of industry personnel is another indication of the changing trend of the times. Instead of retirements, men of prominence in the industry are not being allowed to rest on their past records and to live a life of comfortable retirement. It is the age of consultants, apparently growing from day to day. Take the case of Charles W. Boyce, former secretary of the American Paper & Pulp Association, and relied upon by Washington for his broad experience in the paper industry, who refuses to remain idle but is constantly working on studies of paper trends. Dr. Louis T. Stevenson, former statistician of the American Paper & Pulp Association, is now financial adviser on paper mill problems to a prominent Wall Street investment house. Douglas Crocker is another of those who finds a new field for his experience. This tendency does not apply exclusively to men from the association side of the industry but includes many of those who have

Current comments . . .

graduated from executive positions in their companies into a consultative capacity.

All of these developments indicate that the paper industry is still looking up, and not backward.

Financial Reports

As securities rose to unprecedented high levels during July and early August, paper mill stocks went up with the trend, in the record breaking wave of optimism. Even preferred stocks remained steady, when in ordinary speculative markets the chief interest is in common stocks, with less enthusiasm for preferred securities with fixed rates of dividends.

Net Incomes

American Writing Paper Corp.—Net income for the six months ended June 30 was $289,028, as compared with $282,921 for the comparable 1953 period.

Certain-Teed Products Corp.—Net income for the six months ended June 30 was $2,014,767, as compared with $1,790,178 a year ago.

Charmin Paper Mills Inc.—Net income for the year ended April 30 was $866,878, as compared with $820,272 for the previous fiscal year.

Chesapeake Corp. of Virginia—Net income for the 28 weeks ended July 11 was $1,379,104, as against $1,189,295 for the previous fiscal year.

Eastern Corp.—Net income for the six months ended June 30 was $404,211, as compared with $400,476 a year ago.

Federal Paper Board Co. Inc.—Net income for the first half of 1954 was $1,631,000, as compared with $951,000 a year ago.

Gair Co. Inc., Robert—Net half-year income was $2,704,989, as compared with $3,226,342 in 1953.

Glatfelter Co., P. H.—Net income for the six months ended June 30 was $907,290, as compared with $573,515 for the same months of 1953.

Dividend declarations

Robert Gair Co. Inc. has declared a 37½-cent dividend on the common, payable September 10 to stockholders of record August 20.

International Paper Co. has declared the regular quarterly dividends of $1 per share on the cumulative $4 preferred and 75 cents on the common, both payable September 13 to holders of record August 20.

Marathon Corp. has declared the regular quarterly dividend of 30 cents on the common, payable August 31 to record of August 6; also, the preferred dividend of $1.25, payable October 1 to stockholders of record September 17.

Mead Corp. has declared quarterly dividends of 45 cents on the common and $1.0625 on the 4¼ per cent cumulative preferred, both payable September 1 to holders of record August 3.

Nekoosa-Edwards Paper Co. has declared a 50-cent dividend on the common, payable September 10 to stockholders of record August 27.

Paper mill corporate changes

Certain-Teed Products Corp. has entered into a purchase agreement with the owners of about 70 per cent of the outstanding capital stock of Wm. Cameron & Co. of Waco, Texas. Certain-Teed will pay $11.50 in cash and one share of Certain-Teed common for each share of Cameron. When this purchase has been completed, C-T will make the same offer to all remaining Cameron stockholders. Cameron makes sash and doors and distributes building material products and oil field timbers, drilling clays and chemicals.

Detroit Sulphite Pulp & Paper Co. has been transferred to Scott Paper Co. through the exchange of its assets for 125,000 shares of Scott stock.

Gaylord Container Corp. has merged two subsidiaries with the parent firm. Fairfield Paper & Container Co. of Baltimore, Ohio, and Dresden Paper Mills Co. of Dresden will be known as the Fairfield and Dresden divisions.

Gotham Paper Mills Inc. of Battenville, N. Y., has been sold to Sherman Wiesen, who has changed the name of the firm to Battenville Paper Mills Inc.

Great Northern Paper Co. on July 15 offered 100,000 shares of cumulative preferred stock, 4.4 per cent, $100 par value, at $100. The offering was through an investment group headed by White, Weld & Co. Proceeds will be used in the firm's current expansion and modernization program that is expected to cost $45,000,000.

Hollingsworth & Whitney Co. officials have confirmed rumors that negotiations are underway for a consolidation of its operations with those of Scott Paper Co.

Kimberly-Clark Corp. stockholders have approved a 2-for-1 split in the K-C common stock.

Stock and Bond Quotations

New York Stock Exchange — Stocks

Closing Prices	August 10, 1954	July 9, 1954
A.P.W.	*3-3⅛	3⅞
Celotex	23⅝	22⅛
Same Preferred	17¾	17¼
Certain-Teed Prod.	20¾	17⅞
Champion P. & F.	46¾	46¼
Same Preferred	106	105
Chesapeake Corp.	36	33
Container Corp.	61⅛	55¼
Same Preferred	*103-105	...
Continental Diamond	13¼	12½
Crown Zellerbach	51⅝	48⅛
Same Preferred	103	104½
Dixie Cup	*57¼-57¾	57¾
Eastern Corp.	24⅛	20
Robert Gair	26½	23⅝
Gaylord Container	36⅝	31½
Great Northern P.	68¾	67¾
Hammermill	19½	18½
International P.	75¼	75¼
Same Preferred	*104½-105¾	106½
Kimberly-Clark	71¾	66¼
Same Preferred	*143-144	...
MacAndrews & Forbes	43½	41½
Marathon	25½	25
Masonite	21⅝	21¾
Mead Corp.	38½	37
Same Preferred	98	97
National Container	13⅞	13
Same Preferred	25	23¾
Rayonier Inc.	41¾	37
Same Preferred	38½	36¼
Scott Paper	93⅝	97¾
Same $3.40 Pref.	*94-95½	92
Same $4.00 Pref.	*104-105	105
St. Regis Paper	30⅝	28¾
Same Preferred	*101⅝-102¼	100¾
Sutherland Paper	44⅛	44½
Same Preferred	*153-157	149
Union Bag & Paper	58½	59
United B. & C.	17	15⅛
United Wall Paper	2	1¾
Same Preferred	*16⅛-17¼	...
U. S. Gypsum	183	172
Same Preferred	178½	178
West V. P. & P.	35	32¾
Same Preferred	105¼	106

New York Stock Exchange — Bonds

Celotex 3¼%	...	99
Champion P.&F. Co.. 3%	...	...
Mead Corp. 3%	...	...

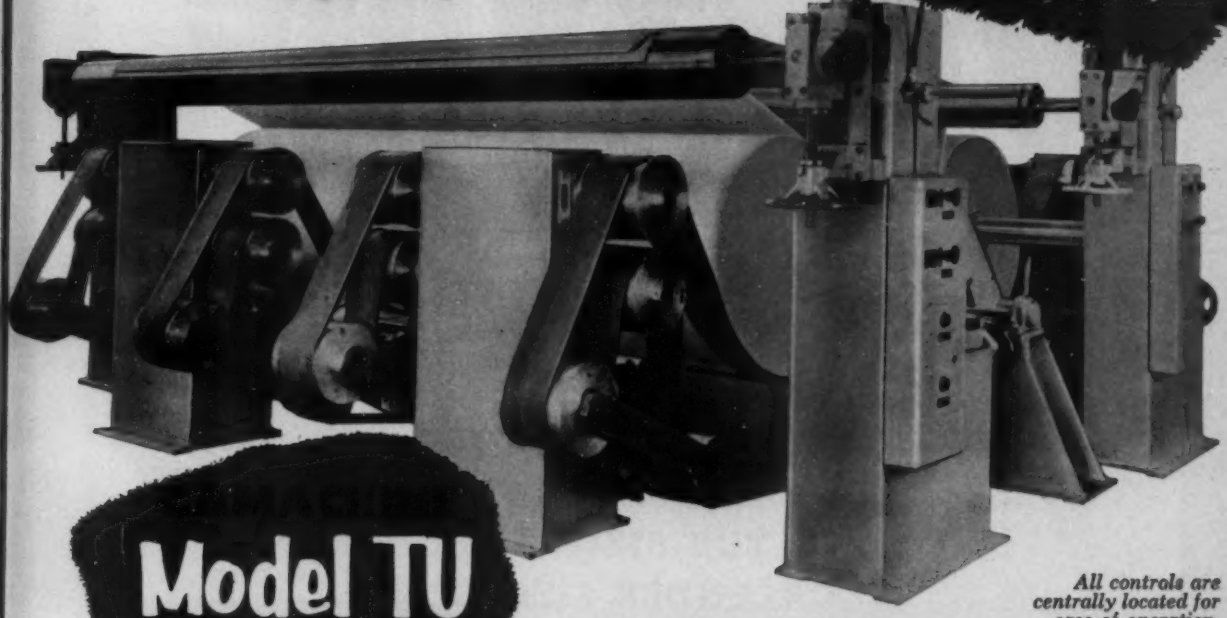
American Stock Exchange — Stocks

American Writing	16	15
Brown Company Common	14⅛	12
Same $5 Preferred	106¼	104
Same $3 Preferred	53	52½
Puget Sound	39⅜	36⅜

*Closing Bid and Asked Prices.

gentle with tissue

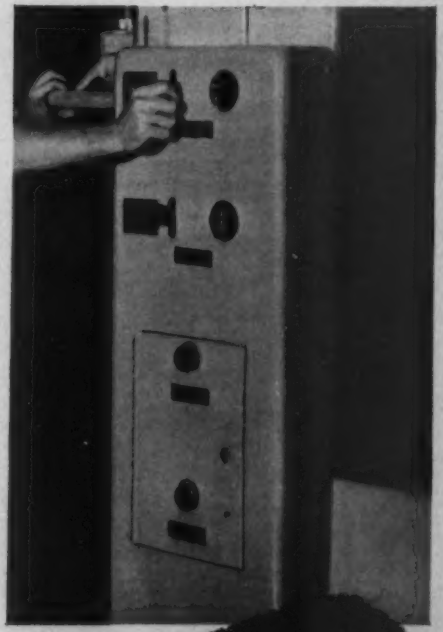
Another Example of Camachine Engineering For Better Rolls at Lower Cost



Model TU

ACE UNWIND

All controls are centrally located for ease of operation.



MODEL TU unwinds two tissue mill rolls simultaneously, combining them to make two-ply web at speeds up to 3500 fpm. Mill rolls are surface-driven by the gentle, positive contact of rubber-impregnated endless woven belts, selected for long wear.

Positive pay-off of the webs, even with out-of-round mill rolls, is assured through a combination of design features. For example: tension control, to minimize stretch and eliminate "snap-offs", is maintained from 0 and up through the adjustable variable speed drive. Mill roll faults, such as "baggy ends" or misalignment, are corrected through vertically adjustable compensating rolls and horizontally adjustable self-aligning reel bar bearings.

Additional features include the centralized push-button control station; pneumatic operation of the reel bar latches; automatic reel bar ejection to reduce downtime; and provisions for disengaging the back section when running single-ply tissue. Installation is at floor level with no pits or holes required to accommodate the drive belts.

In every respect the Model TU assures the high standards of dependability which are demanded in continuous paper mill service... *Follow Camachine Engineering!*

Don't wind up with less than a Camachine

CAMERON MACHINE COMPANY • 61 Poplar Street • Brooklyn 1, N. Y.

Vanzyme

STARCH CONVERTER

for

TUB SIZING
CALENDER SIZING
MACHINE COATING
LAMINATING ADHESIVES

R. T. VANDERBILT CO., Inc.

230 Park Avenue, New York 17, N. Y.

The Paper Industry

September 1954

Chemicals and increased productivity

Without the use of chemicals we obviously can have no chemical pulp, not even bleached groundwood pulp. Without chemicals there can be no high-quality paper or paper products which now — depending on their end use — embody such properties as wet-strength, moisture vapor barrier, water-repellency, high degrees of smoothness, elasticity, resilience, heat-seal properties, resistance to scuffing and abrasion, improved absorption, and even a certain degree of flame resistance.

As estimated by J. B. Calkin and R. W. Kumler in this issue, for every ton of paper some 500 lb. of chemicals are currently being used in the preparation of pulp and the manufacture of paper. From this figure we may conservatively estimate that the pulp and paper industry in this country is using annually some 7,000,000 tons of chemicals. While the bulk of this tonnage is made up of chemicals familiar to every practical papermaker such as lime, sodium sulfate, soda ash, sulfur, caustic soda, chlorine, clay, calcium carbonate, titanium dioxide, aluminum sulfate, starch, and rosins, the continuous demand for increased productivity — which among others puts a premium on the production of new and improved products — has made the pulp and paper industry a fertile field for the application of a surprising and ever increasing variety of chemicals.

In the last eight years we have witnessed the conversion of ten sulfite pulp mills from calcium-base to ammonium-base sulfite pulping. This trend is accelerating. Nine additional mills, it is believed, will be converted to ammonium sulfite pulping within the next three years, bringing the total annual consumption of ammonia in the pulp and paper industry to 44,300 tons.

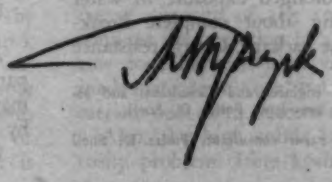
Since 1950, eleven mills on the North American continent have, and by the end of next year, eleven others probably will have installed chlorine dioxide bleaching facilities. The interest in the chlorine dioxide bleaching process is due to the fact that it permits the production of a very white and very strong pulp. It is believed that by 1956 all bleached pulp output in Sweden will be made with chlorine dioxide.

The cost of production of chlorine dioxide is estimated at 20-22 cents a pound, which amounts to 8-8½ cents per pound of its available chlorine. This makes the use of chlorine dioxide as economical as that of sodium hypochlorite. Moreover, the versatility of applications of chlorine dioxide is such that research investigators have recently used this chemical in converting white jack pine chips to white pulp in one operation. Others have pulped sawdust successfully with chlorine dioxide after a preliminary acid and caustic treatment.

Another recent development is the bleaching with peroxides. Nine sulfate mills and twenty-five groundwood mills are now using peroxide bleaching, which in one reported case has resulted in a saving of production cost of $20.00 per ton of rotogravure grade newsprint. The use of peroxide has also been extended successfully to the waste paper recovery process, in view of the peroxide's catalytic effect on various hydrolysis reactions that loosen the ink and facilitate defibering of papers. The current annual consumption of peroxides by the pulp and paper industry is estimated at 20,000,000 lb. As reported by W. J. Noland and B. Armstrong, peroxide bleaching has been successfully applied to high consistency stock bleaching on a pilot plant scale.

Laboratory results on paper properties imparted by neoprene show such promise that a paper bag producing mill has recently completed the first mill-scale production run of bags made from neoprene treated paper. The paper so treated shows a 10 per cent increase in dry and a 500 per cent increase in wet tensile strength, improved elongation and bursting strength, better folding endurance, and many other desirable properties.

These are only a few examples of how chemicals improve the quality of paper or paper products, and hence lead to increased productivity in the pulp and paper industry. Since increased utilization of chemicals is going to be the true pattern of the industry — as is becoming increasingly apparent with each consecutive appraisal of the role of chemicals in pulp and paper making — paper mills will be well advised to secure the necessary technical talent that will enable them to interpret the latest chemical "know-how" in terms of practical paper making.



How important are chemicals in papermaking?

RALPH W. KUMLER* and JOHN B. CALKIN**

FOR EVERY TON OF PAPER made in the United States about a quarter of a ton of chemicals is used in preparing the pulp and fabricating the paper. Paper can be made without chemicals, or at least without substantial quantities, but without chemicals the process is hampered and the properties of the finished product are limited. It is beyond the scope of this article to describe in detail the application of all chemicals used in pulp and paper manufacture; emphasis will be laid only on the newer applications, but a brief look at papermaking without chemicals may not be amiss.

To begin with, no bleached pulp would be available and for volume production reliance would have to be on groundwood. Conceivably some sort of paper could be made of cotton which would have good durability at a price. There would be no durable papers from wood.

In the paper making operation the conditions that existed before the days of slime control agents would prevail and the appearance of slime-spots and the attendant wet end breaks would mean laborious time consuming wash-ups. Felts and wires would be cleaned the hard way. Pitch we would just "live with".

Granted even that we have the present day high quality pulps but are denied chemical modification in the conversion of the pulp into paper, let us see what our situation would be.

Paper could be made with good strength and good color. It could be reasonably smooth, but machine coated or conversion coated papers would not be available. It would be absorbent and not suitable for writing. The absorbency would be variable and, in the case of lower cost papers, tend to disappear on aging. It could be used for tissues and would probably "pass muster" for toweling. Protective packaging in paper would be practically out of the question because there would be no protection against water or other liquids. Prolonged exposure to water would bring about complete breakdown of the package. Grease resistance would be available, but not protection against moisture vapor transfer, either in or out of the package. Pick test could be fair but not up to the standard of modern bond papers. There would be no blueprint paper, milk bottles, shipping sacks, drinking cups, shipping containers, meat wraps, writing paper, hanging paper, or many of the host of industrial papers and paperboards that are commonplace today.

Ralph W. Kumler

John B. Calkin

Originally paper was required only for printing and writing. In order that markets might be expanded it has been necessary for paper to perform duties that have previously been done by textiles, metals, wood, glass and porcelain, not counting the uses of paper that have not been supplied by any other material.

Let us list the properties that are frequently demanded of papers and paperboards that are not inherent in these products without chemical modification.

1. Resistance to water penetration
2. Wet strength
3. Softness
4. Resistance to vapor and gas penetration
5. High tearing strength
6. Smooth surface
7. High resistance to scuffing and abrasion, either dry or wet
8. Opacity
9. Abhesiveness (property of not adhering to sticky materials)
10. Absorbency
11. Flame resistance

Also, properties that can be imparted without chemicals but which may be more advantageously secured by chemical treatment:

12. Grease resistance
13. High dry strength

How are these properties imparted to paper? A complete and detailed answer to this question would call for a voluminous treatise, but we shall attempt to give briefly a general guide to the subject.

Water resistance

The use of rosin and wax sizes is familiar to most papermakers. In recent years modified rosins that are more effective pound for pound in imparting water resistance have come into the picture. The molecule of abietic acid (which, together with similar acids, constitutes the principal ingredient of rosin) contains one carboxyl group. By reacting rosin with certain dibasic organic acids, such as maleic and fumaric, extra carboxyl groups can be added. The extra carboxyls serve to make the rosin more reactive with alkalis and with alum, which seems to provide the reason for the greater potency of the "fortified size".

Another development in this field that is of much technical interest is the appearance of a synthetic size that performs in alkaline pulp and renders paper resistant to the penetration of alkaline aqueous liquids. This is in contrast to sizing obtained with rosin which is effective only in acid pulp and in the finished paper offers no barrier to alkaline water. The new synthetic size may be applied by addition to the stock or by surface application. Quantities required to give good sizing depend on the circumstances but for stock addition vary between 0.5 per cent and 2 per cent of the dry fiber weight. As a tub or calender size, it may be used alone or with starch.

Another comparatively recent development in making paper water resistant is stearato chromie chloride. This is a water-soluble polar material which when applied to the preformed sheet renders it water repellent without attendant slipperiness, which is characteristic of some waterproofing materials. The molecules of stearato chromie chloride become oriented with the hydrophilic end attached to the cellulose and the hydrophobic end protruding to present a water-resistant barrier.

**Chemical engineer and consultant, and assistant to the president, Foster D. Snell.

*Pulp and paper consultant, Foster D. Snell Inc.

Wet Strength

While sizing retards the penetration of water into a sheet of paper, it does not greatly reduce the amount of water that is absorbed in time. Ordinary paper when wet has no strength. Many materials, such as glue-formaldehyde, viscose and tub size applications of urea resins have been used to impart wet strength, but the development did not really get under way until the appearance of cationic melamine resin that could be added to the paper stock before sheet formation. This not only made it feasible for any manufacturer to make wet-strength paper but it imparted better properties than were obtained by the tub-sizing methods. Stock addition gives paper of much higher tearing strength and folding endurance. Cationic and anionic urea resins followed the cationic melamine closely and all three are now used. The U. S. Tariff Commission reports that in the first four months of 1954 consumption of melamine and urea resins by the paper industry was at the rate of 17 to 18 million lb. per year dry weight.

Softness

Where paper competes with fabric, more softness is usually required than is the natural attribute of untreated paper. This is particularly true of tissues for personal use. Many chemicals have been used as softeners, such as glycerine (with or without urea), invert sugar, sulfonated oils and oil and wax emulsions.

Softeners may be divided into two classes according to the type of influence on the properties of paper, viz. humectants that soften by maintaining a high moisture content in the sheet and "bond blockers" which produce softness by partially preventing the fiber-to-fiber bonding which is the basis of stiffness.

Most softeners having no special affinity for cellulose must be added to the preformed sheet by spray or dip method. There is, however, at least one oil base cationic that may be added to slush stock without special equipment. One per cent of the oil based on the weight of dry fiber gives an appreciable effect, and for more pronounced results quantities in the range of 7-8 per cent are sometimes used.

Resistance to Vapor and Gas Penetration

The nature of the papermaking process makes inevitable the production of a porous product. Even glassine, the densest paper made, has about 15 per cent void and provides no barrier to the passage of vapors and gases. The answer is a tight coating or laminating film which may consist of any of a number of materials, such as paraffin wax, microcrystalline wax, Saran, Pliofilm, aluminum foil and polyethylene.

Microcrystalline wax, with the exception of paraffin, is the least expensive of these products, but it is sensitive to heat and is generally too soft for use as an external coating. Therefore, it is generally employed as a laminant between sheets of paper to give an excellent barrier to moisture in vapor or liquid form. Aluminum foil is widely used because of its absolute imperviousness and because of its decorative effect. The material that has experienced the greatest growth over the past few years is polyethylene. In conjunction with paper, it is employed as an extruded film tightly or loosely attached to the surface of paper. Its resistance to grease is good and to vapors and gases, fair. The estimated quantity that will be used for paper treatment in 1954 is 15,000,000 lb.

High tearing strength

Ordinarily the term "tearing strength" means internal tear or the force required to continue the tear once it has been started by cutting with a knife. Very little can be done with chemicals to improve this property except that it is sometimes possible to improve the tearing strength of a hard paper having a high burst and tensile strength by softening it at the expense of the other strength properties.

However, the situation is different with regard to "edge tear", the force required to start a tear at a cleanly cut edge. This property is important because a tear begins at the edge of the paper, and if it can be prevented at that point, internal tearing strength probably is not much of a factor.

Edge tear strength can be imparted by the use of elastomeric materials such as synthetic rubbers. Generally fair amounts are required — upward of 15 per cent of dry content of elastomer on the weight of cellulose. They may be incorporated by impregnation of the dried paper from a latex or by addition of the latex to the stock prior to sheet formation. If the impregnation method is used, the paper must be quite open and absorbent, which limits the development of strength of the paper itself as it is made. If the latex is added to the slush stock, it is quite feasible to give any beating and refining treatment necessary to control various paper properties, although this should be done prior to the addition of the latex.

This development has been retarded in the past by the comparatively high cost of synthetic rubbers and the extreme machine fouling that attended earlier attempts to add synthetic or natural rubbers ahead of the paper machine. Much has been learned about this in the last few years, and it now seems safe to say that the process is economically feasible under reasonably favorable circumstances.

Smooth surface

This property is of great importance to the printing industry. Paper, being composed of fibers, naturally presents a surface short of perfect smoothness. The coating of paper with mineral pigments bound by organic adhesives is old, but until a few years ago it was carried out as an operation separate from that in which the paper is made and was therefore expensive. Now paper is coated on the paper machine, and the volume of this grade of paper is running well over a million tons annually. This development did not come easily. One problem was to prepare coating formulas with as little water as possible in order to put on the maximum coat weight and to simplify drying in contact with metal dryers. This has been accomplished by careful selection of pigments and by replacing the casein formerly used as adhesive in the "off machine" process, with starch. However, starch is less water resistant than casein, which introduced problems when printing with a wet process.

This has been solved by the use of thermosetting resins, such as melamine and urea in conjunction with starch. The addition of 5 to 20 per cent of resin on the weight of starch increases the wet rub resistance to the point where satisfactory wet printing can be done. Wax emulsions are also used to increase water resistance, improve the smoothness and prevent dusting of the coating in the calendering operation. Acid salts are required to cure the resins which tend to increase viscosity of the coating. This confines the operation to a rather narrow zone between high viscosity and inadequate resin cure, but it is being carried out quite successfully.

Also, the high solids create a viscosity problem. Here again chemicals

can help. Dicyandiamide reduces the viscosity of starch solutions and tends to stabilize the viscosity of coating colors. Being non-hygroscopic it does not detract from water resistance. It is effective with both starch and casein and, with the latter, supplements the work of preservatives. It is usually used in amounts of 5-15 per cent on the weight of the adhesive.

Of considerable interest in recent years has been the introduction of synthetic rubber latices as pigment adhesives in coatings. Most experience has been gained with styrene-butadiene types. For the most part, substitution for the older types of adhesives has only been partial, as all-latex adhesives present problems in the way of stickiness on calenders, and reworking of the waste. Used in conjunction with casein or starch, it improves flexibility, smoothness, resistance to curl and printing qualities.

Resistance to scuffing and abrasion

This property is important in a number of paper grades, notably container board where shipping cases undergo considerable rubbing in shipment. If it is expected that the abrasion will take place under wet conditions, the usual wet-strength resins serve very well; and they are also quite effective against dry scuffing. However, a number of materials are used to protect paper or board against dry abrasion. These include starch, usually in combination with wax size, glue, and any of several vinyl resins. Very light applications of these materials usually show substantial results.

Opacity

This is of great importance in printing papers, as it is imperative that the ink does not show through on the opposite side of the page. Of course, mineral pigment coating is one very effective way of bringing up opacity. Also, mineral pigments are used in uncoated papers, the most common types being clay, calcium carbonate, and titanium dioxide.

One very interesting development entering the commercial phase is "fibrous filler," a pigment formed in the presence of and attached to part of the fiber furnish. Pulp is treated successively with calcium chloride and sodium silicate precipitating calcium silicate on the fibers. The ratio of pigment to cellulose is about four to one. The salt formed in the reaction may or may not be washed out. This fibrous filler may then be added to the regular pulp furnish in the required amount.

Advantages reported for this method of loading paper are:

1. High pigment retention
2. A resilient sheet — cushioning for printing
3. Very high brightness
4. High opacity

Abhesiveness

This is the property which prevents adhesion of paper to sticky materials and is imparted by surface applications of various materials such as silicone resins, wax applied in emulsion form, and metallic soaps used in the form of dispersions. Very light applications are usually sufficient to serve the purpose.

Absorbency

With the tremendous growth in personal tissues, absorbency has assumed a position of importance in the category of paper qualities. Pure cellulose is naturally quite absorbent, but papers made from unbleached pulps and old papers may lack this quality. Furthermore, they tend to become less absorbent as they age.

This problem is being met with surface active agents of the rewetting type. Note that there is some difference between wetting and rewetting. A wetting agent may impart high penetrating power to water but when dried may not make the treated product particularly absorbent. Rewetters are characterized by the capacity for imparting absorbency. Some rewetting agents are not substantive to cellulose and must be applied to the preformed sheet. New cationic rewetters that need only to be added to the slush stock and are well retained when the water is drained away, are available. Generally small fractions of a per cent based on the dry fiber serve the purpose adequately. They not only make the freshly made paper more absorbent but tend to prevent the loss of this property in storage.

Flame resistance

The demand for papers that resist combustion is a real one. Paper that is not damaged by heat can scarcely be made of organic fibers, but it seems not beyond reason that paper could be made that would not propagate fire. In fact, it can be done now, but at the expense of water resistance and some other properties; for the materials that impart this property must be applied by saturation, which calls for a more or less absorbent paper. Among the chemicals that impart flame resistance are the sulfamates, guanyl-urea phosphate, guanidine phosphate, ammonium phosphates and various other salts of phosphoric acid and of ammonia. Generally amounts in the range of 10-15 per cent on the weight of paper are required.

With rigid boards used in building construction, the situation is different. There it is usually necessary to protect only one side of the board, and this is being done satisfactorily with flame-resistant coatings. There are as many formulas for these coatings as there are manufacturers, but most include a mineral pigment, an organic adhesive, and a nitrogen bearing chemical, such as melamine resin, urea resin dicyandiamide and the like. In some cases a wax emulsion is added to act as plasticizer and to add water resistance. The nitrogenous materials provide intumescence, *i.e.* the coating on application of a flame forms a spongy carbonaceous mass which effectively insulates the board underneath the coating. Decomposition stops when the source of heat is removed.

Grease resistance

This property commonly required in papers used for food packaging has been imparted by beating pulp to a very low freeness so that a very dense sheet is obtained. However, this is an expensive process, and sometimes it does not permit building into the paper other desirable properties. It has long been an objective of the industry to produce greaseproof paper by an inexpensive chemical treatment.

Unfortunately, so far it has not been possible to impart grease resistance in the same way that water resistance is achieved. We obtain full sizing against water even in highly porous papers by surrounding the pores with water-repellant material which retards the water penetration sufficiently for most purposes. But, to date, nothing has been made available commercially that can be attached to fibers that will repel grease, although there are indications that it may be technically possible in the future.

At present, grease resistance is only attained chemically by laying an impervious film on paper. A measure of grease resistance is secured by a film considerably short of being continuous. Materials commonly used are cellophane, carboxymethyl cellulose, zein, algin, glue, aluminum foil, various vinyl resins, and certain acrylic polymers. The amounts required will

depend on the smoothness of the paper surface, the degree of grease resistance required and the nature of the material used. With good film formers and a very smooth surface, a minimum of 2 lb. per 1,000 sq. ft. is required.

High dry strength

Strength in paper has traditionally been developed by starting with long strong fibers and beating them in such a way as to achieve the maximum of the type of strength desired. As beating proceeds, all types of strength increase, but soon the tearing strength curve turns downward and continues so while tensile and bursting strengths continue upward. If heavy treatment is demanded, the process requires much expensive equipment and a certain amount of time in the process. Also, when strength is developed by beating, the paper is very sensitive to atmospheric moisture variations, which means curling and dimensional changes if humidity is not carefully controlled.

Papermakers have for years dreamed of an inexpensive chemical that could be added to pulp that would increase strengths of all types (including tear), which would not unduly stiffen the sheet, yet would not be conducive to curling under humidity changes or limpness in very moist atmospheres. Chemical manufacturers have had this in mind too and some progress has been made. However, strengthening chemicals behave much like beating in that tearing strength is not improved. The wet-strength resins, melamine and urea, meet two of the conditions, *i.e.* they increase tensile, burst and folding endurance without the sensitivity to moisture that attends strength developed by beating. They do permit the production of paper with minimum tendency to curl or change dimensions. But wet strength goes along with these properties which is undesirable where not needed.

Other large-molecule colloids which impart little or no wet strength are used to impart high dry strength. Starch has some effect and glue has occasionally been employed as a stock additive for the purpose. More recently, the mannogalactans, guar and locust bean gum have come to the fore and are reported to be widely used. McCarron describes the results of trials of mannogalactan added at the fan pump in comparison with starch added at the beaters. Increases in bursting strength of 3-17 per cent and in tensile of 0-50 per cent at considerably higher machine speed were noted. The amounts or precise types of materials were not given.

Substantial strength increases with starch are reported if it is coprecipitated with alumina on the fibers. Rowland alkalizes the starch and precipitates it with alum. Patilloch uses starch, sodium aluminate or metasilicate and alum.

Working on the problem of strengthening paper, one soon learns to have respect for the bond established by merely waterlaying fibers in a reasonably uniform pattern. The best promise of a good chemical bonding agent appears to be along the line of a product that supplements the natural bond of fiber to fiber rather than blocking and replacing it. All bonding agents that have met with success have been hydrophilic materials. There is reason to hope that still better bonding agents will be available in the future.

Chlorine dioxide bleaching*

W. HOWARD RAPSON
Professor of Chemical Engineering
University of Toronto

Since one pound of chlorine dioxide is equivalent in oxidizing power to 2.68 lb. of available chlorine, its cost amounts to only 8 - 8½ cts per pound of available chlorine based on the all-inclusive production cost of 20 - 22 cts per pound of chlorine dioxide.

IN THE MIDDLE FORTIES, methods of producing chlorine dioxide were developed in pulp mills in Canada and in Sweden. Chlorine dioxide plants were built by three pulp mills in 1946: Kipawa mill of Canadian International Paper Co., Temiskaming, Quebec; Husum mill of Mo och Domsjö A/B in Sweden, and Skutsgär mill of Stora Kopparbergs Bergslags A/B, also in Sweden.

Since 1950, many other mills have installed chlorine dioxide plants: Hawkesbury, Ont. mill of Canadian International Paper Co. and Natchez, Miss. mill of International Paper Co. in 1950; Harmac mill of MacMillan & Bloedell Ltd., Nanaimo, B. C. in 1951; Riegelwood mill of Riegel Carolina Paper Co. in 1952; Hornefors mill and Domsjö mill of Mo och Domsjö in Sweden; Kelheim mill of Waldhoff Zellstoffabrik in Germany; Stockstadt mill of Aschaffenburger Zellstoffwerke in Germany in 1953, and Korsnas A/B in Gavle, Sweden in 1953.

*Presented before the 35th annual convention of the American Pulp & Paper Mill Superintendents Association, held at Montreal, Que., June 21-23, 1954.

More recently, but not in chronological order, chlorine dioxide plants have been installed in several other mills: Puget Sound Pulp and Timber Co., Bellingham, Wash.; Potlatch Forests, Inc., Lewiston, Idaho; P. H. Glatfelter Co., Spring Grove, Pa. Fernandina, Fla. mill and Jessup, Ga. mill, Rayonier, Inc., and LaTuque (Quebec) mill of Brown Co.

About 11 other mills are either designing or building chlorine dioxide installations. Many other mills are giving the matter serious consideration. Eleven mills now have chlorine dioxide plants on this continent; at least another 11 mills will probably have them before the end of next year.

This great concern about chlorine dioxide bleaching has resulted largely from the introduction on the market of a very white and very strong kraft pulp.

The superior properties of these pulps have made such an impression on the whole paper industry that they have been mainly responsible for arousing the keen interest in chlorine dioxide today. Chlorine dioxide, however, has not been restricted to kraft paper pulp. In Sweden today it is being used on all kinds of pulp, both softwood and hardwood, both sulfite and kraft, both paper and dissolving. In Germany, so far as is known, it is being used only with sulfite pulps because all sulfate mills are in the Eastern Zone, and information concerning them is not available.

Canadian International Paper Co. has used chlorine dioxide for several years for bleaching dissolving pulps made by the sulfite process. In the United States, International Paper Co. has been using it for sulfate dissolving pulp from hardwoods. Only recently, the first installation on this continent for bleaching sulfite paper pulp was made at Puget Sound Pulp & Timber Co. These operations show that chlorine dioxide is being applied to quite a wide variety of pulps today.

Sweden converts to ClO_2 bleaching

Perhaps the extent of the interest in chlorine dioxide bleaching can best be judged by what is happening in Sweden. As a result of litigation carried on in the courts, only Korsnas A/B and their licensee, Mo och Domsjö A/B, are permitted to use chlorine dioxide bleaching by one method; and Stora Kopparbergs A/B, having bought the Scandinavian rights to certain Mathieson patents covering other methods of using chlorine dioxide, are also able to use it.

All other companies in Sweden are anxious to use chlorine dioxide because of the edge now possessed by their competitors. Therefore, they are now actively investigating methods of producing chlorine dioxide and methods of bleaching with it. Both patents involved, however, run out in 1955, the last one in December of that year. At that time all companies in Sweden will be able to use chlorine dioxide bleaching. All companies are preparing to do so.

The expectation is that by the beginning of 1956 all bleached pulps from Sweden will have been bleached with chlorine dioxide. If, by that time, American and Canadian mills are not bleaching with chlorine dioxide, their competitive position in the world markets will be rather poor compared with the Swedish mills for the highest grades of bleached paper pulp and dissolving pulp.

Therefore, our main objective is to answer three simple questions: (1) What is involved from an operating point of view in using chlorine dioxide in the mills? (2) What can be accomplished by using chlorine dioxide that cannot be accomplished in other ways? (3) What are the economics of bleaching with chlorine dioxide?

What it involves

The first requirement is the selection of a process and the installation of a chlorine dioxide generating system. All chlorine dioxide is manufactured from sodium chlorate. Various methods of making chlorine dioxide have been discussed by the author in a recent paper (3). Four processes are in use on this continent at the present time, and all of these processes are producing chlorine dioxide of sufficient quality and quantity at reasonable cost.

The chlorine dioxide must be produced as it is needed. In some mills the chlorine dioxide is generated as required with little or no storage of the solution. In other mills relatively large storage capacity is installed so that the operation of the chlorine dioxide plant can be interrupted if necessary without stopping the flow of the chemical to the bleach plant. All generators installed to date require either a full-time or part-time operator. Yet, it is possible with sufficient instrumentation to make an installation automatic.

Chlorine dioxide is a rather versatile chemical. It can be used under quite a wide variety of conditions to achieve similar results. It is being used over a pH range of from about 2.5 to 9.0. It is being used at very low consistency and at relatively high consistency; at low temperature and up to 170° F. At each combination of pH, consistency and temperature a particular time is required to bring about complete reaction of chlorine dioxide with pulp. How can a set of operating conditions be selected? What factors affect this decision?

When chlorine dioxide is mixed with pulp, it reacts with the colored contaminants, thereby bleaching them without appreciably degrading the cellulose. The chlorine dioxide is reduced to chlorite ion. The rate of reaction of the chlorine dioxide with the pulp increases as the pH rises. Below pH 9 there is little damage to the cellulose. As the pH rises above 9, the rate of reaction is very fast; and damage to the cellulose begins to be serious, with loss of strength of paper pulps and lowering viscosity of dissolving pulps.

What happens to the chlorite formed from the chlorine dioxide? Above pH 7 it does not react and, therefore, accumulates in the solution. But, as the pH drops below 7, the chlorite is also an active bleaching agent. Hence, at low pH somewhat less chlorine dioxide is required to effect the same degree of bleaching, provided the time and temperature are increased sufficiently to compensate for the much slower rate of reaction. Under neutral or slightly alkaline conditions the rate of reaction of the chlorine dioxide is greater; therefore, lower temperature and shorter time may be used, but the bleaching activity of the chlorite formed is reduced or eliminated. Thus, the amount of chlorine dioxide required is somewhat higher as is the residual chlorite. If, after using the chlorine dioxide under neutral or slightly alkaline conditions, the pulp and liquor are acidified, the residual chlorite becomes an effective bleaching agent. This process forms the basis of the Mathieson patent (5, 6) available to Stora Kopparbergs Bergslags A/B in Sweden.

There is a choice between low pH, high temperature, high consistency and longer time, and higher pH at lower consistency and lower temperature for a shorter time.

Corrosion and prevention of ClO_2 losses

In most installations one combination of low pH, high consistency, high temperature and the longer time are being used, but these conditions involve some serious difficulties. While there is definitely the advantage of better utilization of the chlorine dioxide, under these conditions, corrosion is rather severe. Also, there is a greatly increased tendency for the chlorine dioxide gas to escape from the solution at the high temperature and high consistency. This raises the difficult problem of containing the gas and preventing its escape into the atmosphere, both from the point of view of its toxicity and the loss of chlorine dioxide as an economic loss. Considerable ingenuity has gone into overcoming these two problems, but completely satisfactory solutions have not yet been found.

The corrosion problem is overcome by using tile-lined towers, pointed with a furane resin cement, and plastic-lined or ceramic piping. The chief problem is with the mixer. It has a relatively long life if made of Hastalloy C type alloys, but these alloys are expensive. Mixers made from 316 stainless steel with very low carbon are being used, but they have a short life, usually between one and two years.

The only satisfactory solution to the problem of retaining the chlorine dioxide gas is to completely contain it, and provide adequate venting for pressure relief. A common installation is a downflow high-density tower, provided with a vent through a small absorption tower with water trickling over the packing to strip out the chlorine dioxide from the air and return it to the reaction tower. These towers are provided with an explosion lid, usually consisting of a lead plate resting on a rectangular hole. Because of the high temperature and high concentration of chlorine dioxide in the top of the tower, explosions are rather common in some mills. When they do occur, they cause very little trouble. They are very mild and usually are described as puffs. The explosion lid immediately settles into place and bleaching continues.

The explosion is caused by decomposition of the chlorine dioxide into chlorine and water. However, since the partial pressure can never get very high before explosion occurs, the gases are greatly diluted with air. The rate of propagation is very low, the heat produced is relatively little, and the expansion is very little, accounting for the usual mild nature of the explosion or puff.

In some recent installations, an attempt has been made to diminish the loss of chlorine dioxide and also the explosion hazard by using a narrower diameter about 6 ft. up-flow tower or pipe, through which the stock, after being mixed with chlorine dioxide, passes to the top of the down-flow tower. In the 10 minutes or so that the chlorine dioxide is effectively sealed in with the pulp in this up-flow tower, a great deal of the reaction takes place; and, therefore, the partial pressure of the chlorine dioxide in the top of the down-flow tower is greatly reduced.

Another attempted solution to this problem is offered by Kamyr, consisting essentially of a small down-flow pipe feeding the stock to an up-flow high density tower. The chlorine dioxide is introduced into the stock in the bottom of the down-flow pipe, and then passes through a double mixer at the bottom of the up-flow tower. If this layout operates satisfactorily, it should be the best solution to the problem, since chlorine dioxide will be trapped with the pulp until the end of the retention time, when most of it should be consumed. Such an installation was made at Korsnas A/B in Sweden for 6 per cent consistency, but it is now proposed to use much higher consistencies.

Under conditions of high acidity, high temperature, and high consistency, the problem is to get the pulp to take up as much chlorine dioxide as possible, and therefore to reach the maximum brightness which can be achieved. Actually, the amount of chlorine dioxide which can be consumed is limited. Usually, only 0.4 to 0.6 per cent chlorine dioxide on pulp is taken up if the brightness entering this state is about 70 per cent; although, with some pulps, more or less is consumed. With strong kraft pulps these conditions usually give a brightness varying between 86 per cent and 89 per cent. A brightness of 90 per cent is reached occasionally, but 88 per cent is more common. In an attempt to reach 90 per cent brightness consistently, two mills have installed double chlorine dioxide bleaching with a caustic extraction stage in between. This requires the installation of additional equipment; but the total consumption of chlorine dioxide is not increased very much, and an increase of one or two points in brightness is usually attained.

At what bleaching stages is it used?

In most mills the chlorine dioxide is used as the final stage of a multi-stage bleaching system; but a patent by the author (4), assigned to Canadian International Paper Co., discloses the use of chlorine dioxide followed by a light hypochlorite treatment. This process was found to give whiter pulp than has been attained by any other method of bleaching. Last summer, while visiting Germany, the author found that sulfite pulps were being bleached in two mills by chlorine dioxide followed by hypochlorite.

The use of chlorine dioxide in neutral or slightly alkaline solution was disclosed by Vincent (5) in a patent assigned to Mathieson Alkali Works in 1938. This procedure has the advantage of requiring lower temperature and shorter time; and, therefore, may be used at lower consistencies economically. It has the added advantage that the chlorine dioxide treatment may be carried out in existing equipment, which is normally resistant to alkaline hypochlorite, for the corrosive effect of the chlorine dioxide is very much less under these conditions.

In those cases where residual chlorine dioxide is left in the pulp and the pulp is to be washed, the solution is very corrosive at lower pH. Some steps must be taken to eliminate its corrosiveness before it is pumped to a stainless steel or rubber-covered washer. In some mills SO_2 is introduced into the stock leaving the downflow tower, while in other mills caustic soda is used. In the first case, the stock is left acid, due to the formation of sulfuric acid. In the second case, the chlorine dioxode is destroyed by reaction with the caustic soda; and, therefore, the pulp is left alkaline. Either method of destroying the chlorine dioxide appears to be adequate.

What it accomplishes

What can be accomplished by using chlorine dioxide that cannot be accomplished in other ways? First and foremost, by proper use of chlorine dioxide in combination with other stages, whiter pulp can be made than by any other commercial bleaching agent. Furthermore, at any particular level of brightness it is possible to make pulp with less strength loss than is possible with hypochlorite bleaching alone. For dissolving pulps, chlorine dioxide will permit a higher level of brightness to be reached with very little viscosity drop.

Certain levels of brightness can be reached by peroxide bleaching as well as with chlorine dioxide; but the chemical cost to achieve the same brightness level is usually much more than with chlorine dioxide. The ultimate brightness level which can be reached with hydrogen peroxide is not as high as that which can be reached with chlorine dioxide bleaching.

By using chlorine dioxide, certain levels of brightness can be reached with fewer stages of bleaching than with hypochlorite. This advantage is very important in old bleach plants which are being expanded, or in the design of new bleach plants, from the point of view of economy. For example, 80 per cent brightness can be reached with kraft pulp in four stages including chlorine dioxide, while many bleach plants use seven stages to reach this level with little degradation. The saving in capital cost of the three extra bleaching towers with their washers and auxiliary equipment usually more than offsets any little extra cost involved in the use of chlorine dioxide.

Many people believe that chlorine dioxide gives cleaner pulp than hypochlorite bleaching for the same level of brightness. However, I would not recommend chlorine dioxide in place of centrifugal cleaners for the removal of dirt. As a supplement to centrifugal cleaners, however, chlorine dioxide has a favorable effect on dirt elimination if properly used.

What it costs

We now come to one very important aspect of chlorine dioxide bleaching that has been overlooked for a long time. Most mills can make chlorine dioxide for between 20 and 22 cents per lb. including capital charges, operating costs, overhead, and raw materials costs. One pound of chlorine dioxide is chemically equivalent in oxidizing power to 2.63 lb. of available chlorine; therefore, chlorine dioxide costs about 8 to 8½ cents per lb. as available chlorine. This cost is about the same as sodium hypochlorite in many mills and a little less than sodium hypochlorite, plus the additional caustic soda used to maintain high pH in some mills. This cost is higher than the cost of lime bleach, but many mills are actually using sodium hypochlorite for bleaching today.

Since the chlorine dioxide used usually offsets about an equivalent amount of hypochlorite, the chemical cost of using chlorine dioxide may be very small indeed. Hence, the benefits of chlorine dioxide bleaching can be obtained at little or no additional chemical costs. This fact alone is a great stimulant to the utilization of chlorine dioxide for pulp bleaching.

Let us assume that the cost of chlorine dioxide bleaching is added to the ordinary costs of bleaching. Generally, 0.5 per cent chlorine dioxide is about all that can be taken up by pulps of about 75 per cent brightness or better. This consumption amounts to about 10 lb. of chlorine dioxide per ton of pulp. At 22 cents per lb., the cost would be $2.20 per ton of pulp extra for chlorine dioxide. However, if this chlorine dioxide saves 1.5 per cent available chlorine as sodium hypochlorite, or 30 lb. per ton, the saving, at 8 cents per lb., would be $2.40 per ton of pulp. This saving amounts to about the cost of the chlorine dioxide. The net chemical cost of using chlorine dioxide, therefore, would be about zero. If the saving hypochlorite is not that high, or if lime bleach is used rather than soda bleach, it may cost up to $1.00 per ton to use chlorine dioxide. This cost is relatively small for the gain in brightness and the gain in paper strength which can be obtained.

It is difficult to consume as much as 0.5 chlorine dioxide on sulfite pulps. Usually less chlorine dioxide is taken up, say 0.3 to 0.4 per cent on such a pulp; therefore, the cost with sulfite pulp is even less than it is with sulfate pulp.

Future potential of ClO_2

What of the future? Relatively little work has been done with chlorine dioxide on either lower brightness pulps or semichemical pulps, because it has been regarded as an expensive bleaching agent. Now that its cost is relatively low, more experimental work will probably be done with it on such lower grade pulps. Extension of chlorine dioxide bleaching in this direction is to be expected.

As previously pointed out, the saving in the number of bleaching stages from a capital cost point of view alone more than offsets any additional cost there might be in using chlorine dioxide. Thus, it is probable that most future bleach plants will include chlorine dioxide, even for lower brightness pulps.

Can chlorine dioxide be expected to become even cheaper than it is now? The installation of additional equipment for the recovery of chemicals can reduce its cost by a few cents per pound. There is a little to be gained in cost by development of new methods of manufacture to recover a little higher percentage of the chlorite as chlorine dioxide. However, since the yields being obtained in present plants are fairly high, only five or ten per cent improvement at the most can be expected in this direction.

With present costs of power and construction of chemical plant, it is unlikely that new capacity for sodium chlorate manufacture will permit this chemical to be marketed at a lower price than the present level. The possibility of manufacturing sodium chlorate in pulp mills has been considered by many companies. The large capital investment involved, the high power requirement, and the fact that the unit required is below the minimum economic size has made the proposition so unattractive that no pulp mill has installed a sodium chlorate plant on this continent.

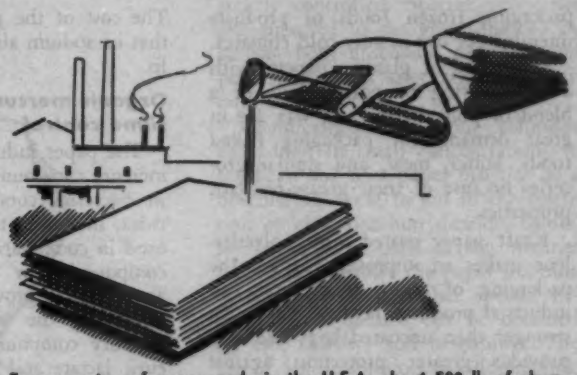
It does not seem likely that chlorine dioxide can be made in the foreseeable future for less than about 15 cents per lb. in any pulp mill. Even at this price, which is 5.8 cents per lb. of available chlorine, chlorine dioxide would be about as cheap as lime bleach. Such a price would permit chlorine dioxide to almost eliminate hypochlorite bleaching.

Research laboratories are testing chlorine dioxide in radically different ways from what are now considered practical. For example, converting jack pine chips to white pulp in a single stage with chlorine dioxide was reported recently (7). Pulping sawdust after a preliminary acid and caustic treatments has been carried out (8) with very interesting results. Pulps have been bleached with only chlorine dioxide to strong, white paper pulps. These new concepts and the current research can lead to more extensive use of this very versatile, slightly elusive, mildly hazardous, relatively cheap, highly efficient bleaching agent, which makes such a vigorous attack on lignin and resin, but is very kind to cellulose and the other carbohydrates in wood.

References:

1. Schmidt, E., Ber. 54B: 3111-4 (1921).
2. Schmidt, E., Fr. pat. 550,213 (1922); Brit. Pat. 191,357 (1923); Ger. pat. 400,224 (1924).
3. Rapson, W. H., *Tappi*, 37: 129-37, (April, 1954).
4. Rapson, W. H., Can. pat. 470,478 (1951); U. S. pat 2,587,064 (1952).
5. Vincent, G. P., U. S. pat. 2,129,719 (1938).
6. Vincent, G. P., U. S. pat. 2,166,330 1939).
7. Hurtubise, F. C., *Pulp Paper Mag. Can.*, 55: 173-4 (1954).
8. Levitin, N., and Schwartz, H. J., Forest Products Research Soc. 3: 78-84 (1953); *Pulp Paper Mag. Can.* 55: 92-98 (January, 1954).

Some selected uses of chemicals



For every ton of paper made in the U.S.A. about 500 lb of chemicals are used in preparing the pulp and fabricating the paper.

A staff presentation

MANY WAYS OF IMPROVING productivity through the use of chemicals in pulp and paper making will become apparent from the following discussion of imparted properties and a number of selected new process applications.

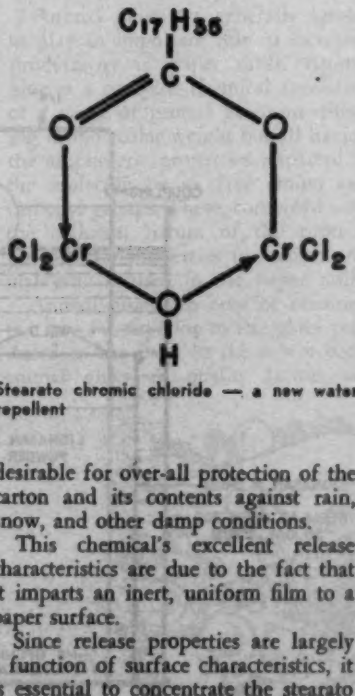
Increased water repellency

Stearato chromic chloride is a novel water repellent and sizing agent developed primarily for the treatment of paper products. It is a water-soluble chromium-stearic acid complex whose outstanding resistance to water and aqueous solutions, as well as excellent release characteristics, are derived from the fact that its chromium groups anchor tightly to the paper surface and the hydrophobic stearate groups are oriented upward.

The stearato chromic chloride solution, used in 1 to 2 per cent concentration, can be applied at the size press, calender stack, water boxes by spray, transfer rolls, or immersion. Its retention may be varied from 5 to 20 lb. per ton of paper, depending upon the weight and type of paper treated or the degree of water repellency desired.

The preferred method of application is at the size press. Where a size press is not available, calender stack application for the heavier weight paper and paperboard is recommended, using a 3 to 7 per cent stearato chromic chloride solution. The spray application is carried out at the wet end of the machine. In converting operations the solution may be applied by immersion or transfer rolls.

The water-repellent properties imparted by stearato chromic chloride are of particular importance in shipping containers of the corrugated and solid fiber variety. Liners treated with this water repellent may be used on the interior of cartons for packaging and shipping such items as frozen or fresh fish, fresh lobsters, wet vegetables, fruits, fresh-cut flowers, freshly butchered meats, etc. Water-repellent carton exteriors are desirable on cartons used in refrigeration storage, in order to prevent absorption of condensed moisture when the cartons are removed for shipment. Finally, water repellency is



Stearato chromic chloride — a new water repellent

desirable for over-all protection of the carton and its contents against rain, snow, and other damp conditions.

This chemical's excellent release characteristics are due to the fact that it imparts an inert, uniform film to a paper surface.

Since release properties are largely a function of surface characteristics, it is essential to concentrate the stearato chromic chloride complex as much as possible on the surface of the paper. For this reason absorbent papers, or papers of open formation, are not particularly suitable for use as base sheets. On the other hand, greaseproof, glassine, and parchment papers are excellent base papers for development of release characteristics. Regular varieties of kraft or sulfite papers, such as gumming kraft, butcher, and board, if desired, can be modified with film-forming agents, such as starches or glues, to reduce porosity and increase surface smoothness to a sufficient degree to permit their use as base sheets for the development of good release characteristics.

The cost of the stearato chromic chloride treatment is low. In normal applications its retention is only about 1 lb. per 10,000 sq. ft. of paper surface.

Heat is necessary to dry the treated paper and to cure the stearato chromic chloride complex itself in order to develop maximum size and water repellency. The dryers of the paper machine or the hot plates of the combiner unit in normal operation are adequate to supply the necessary heat.

Another advantage of the stearato chromic chloride complex is its property of preventing so-called grease crawl.

Polyethylene in rapidly growing demand

With an unusual combination of properties, such as (1) freedom from taste, odor, toxicity; (2) flexibility at extremely low temperatures; (3) low moisture-vapor transmission; (4) resistance to chemicals, solvents, greases; (5) lightness of weight; (6) dielectric characteristic; (7) heat-sealability, and (8) tear strength, polyethylene is enjoying ever-increasing popularity in the paper field.

Because of its flexibility at very low temperatures, paper coated with polyethylene is in demand as a material for

packaging frozen foods or products intended for use in very cold climates.

Chipboard or glassine papers, with a thin coating of polyethylene or a blend of polyethylene and wax are in great demand for packaging baked foods, butter, meat, and similar groceries because of their grease-resistant properties.

Kraft paper coated with polyethylene makes an improved bag for the packaging of many agricultural and industrial products, because it is much stronger than uncoated bags and also provides greater protection against moisture penetration. Multi-wall bags treated with polyethylene are being used to package such items as dried eggs, powdered milk, raw meat trimmings, peat moss and humus, chemicals, and fertilizers.

Polyethylene, with a density of 0.92, is one of the lightest plastics known. One pound of the resin can cover 3,000 sq. in. of surface, leaving a film 0.001 in. thick.

While the average film thickness of polyethylene applied on paper is 0.00075 in., the application can be made as thin as 0.0001 in. The present price range of polyethylene is 41 to 43 cents per lb.

The paper industry started to use polyethylene in 1948 with the application of the film extrusion method in paper-coating, devloped and refined in the du Pont laboratories. This has become a successful commercial method of applying polyethylene to paper, film, fabric, and metal foil. Currently 25 papermills and converters in this country are using polyethylene.

New uses of polyethylene in the paper field are indicated in (1) the board field for the manufacture of coated boxes, both corrugated and solid, and (2) in-transit packaging.

Amber bone glue versus sodium aluminate

As reported directly from the Rhinelander Paper Company, considerable improvement in pigment and fiber retention in the save-all, as well as general improvement in the latter's operating efficiency, has been achieved by the use of amber bone glue as a flocculating agent instead of the previously used sodium aluminate. The approximate amount of glue used is 1.5 lb. per 1000 lb. of paper. This corresponds to an hourly consumption of 5 lb. of dissolved glue by a white water effluent of 800 gal. per min., compared to the previous sodium aluminate consumption of 100 lb. a day. The cost of the glue is 19 cents and that of sodium aluminate 12 cents per lb.

Organic mercury compounds for slime control

The paper industry is using organic mercury compounds as important tools in bacterial control. Various fungicides, including the phenolics, can be used in combination with the mercury compounds for complete protection against slime growth.

Among the widely used organic mercury compounds are phenyl mercuric lactate and phenyl mercuric acetate, compounded with various forms of fungicides.

A new mixture contains 6.25 per cent of ethyl mercuric phosphate, one of the most powerful bactericides and fungicides known. The mixture is soluble in water up to a concentration of 2 lb. per gal. This mixture also contains a small amount of a warning agent which has a highly penetrating and characteristic odor. While ethyl mercuric phosphate is of low volatility, it breaks down on contact with the air to form the highly volatile and toxic diethyl mercury. Whenever there is an appreciable odor of the warning agent, one may assume that some organic mercury is also present in the air, and the necessary precautions should then be taken.

Fig. 1 illustrates du Pont's suggested method of dissolving this fungicide without having to remove it from the shipping drum. After a drum is once prepared, it can be used indefinitely by removing the regular drum head and replacing it with a prepared head, tightening the bolt around the head which holds it in place.

The inlet pipe should extend fully to the bottom of the fungicide drum, and the tangential opening should be as close to the bottom as possible; otherwise undissolved powder or solid material will remain in the drum.

The elaborate valve arrangement shown in the sketch can be avoided if an elevated water supply tank which is equipped with float valve feed and located high enough to furnish 5 to 10 lb. water pressure is used. This arrangement has the advantage of providing a break in the inlet feed lines. It prevents reversal of flow and also avoids need for the outer 55-gal. drum,

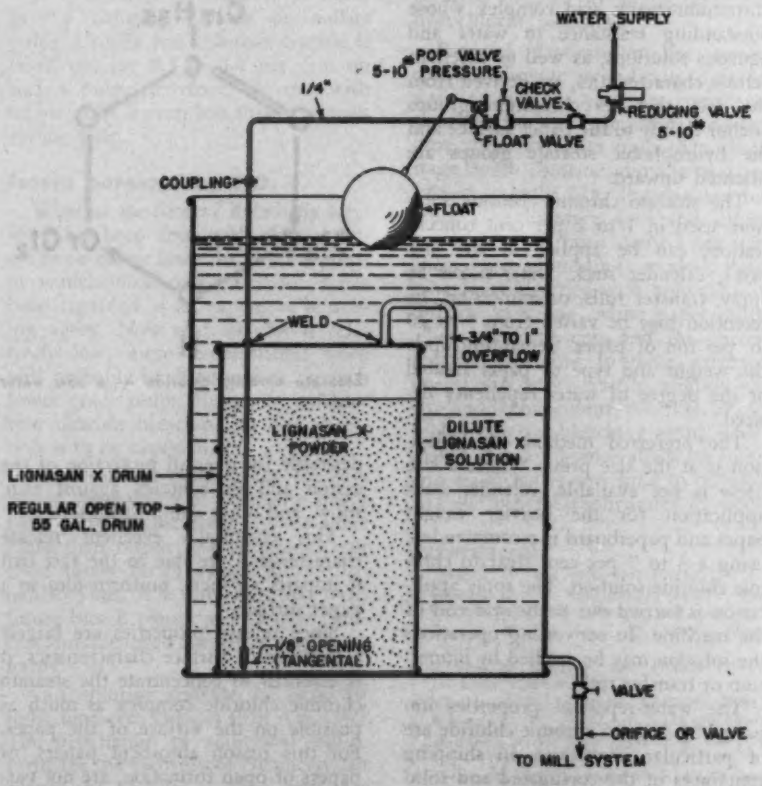
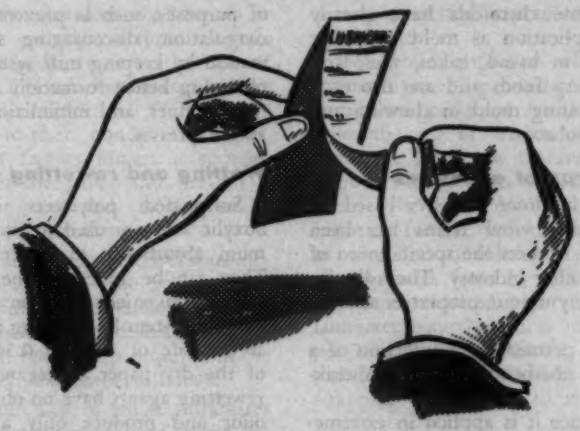


Fig. 1—du Pont's method of dissolving certain fungicides



Release characteristics find application in pressure-sensitive tapes, rubber separator papers, bakery pan liners, meatboard and wrappers, especially for deep freeze packaging.

thus permitting direct feed to the system.

Feed to the mill system may be either continuous or by "slug dose" application. The powder can be dissolved in a variable period (1 to 14 days), depending on the rate of water flow maintained through the drum. The strength of the resultant solution will remain reasonably constant until the bulk of the powder has been dissolved. More rapid solution can be obtained by warming the water fed into the drum, but the temperature should never exceed 140° F. All fungicide powder will have disappeared from the drum after the distinctive color disappears from the liquid in the outer drum.

Galactomannan gums

Formerly obtained from the locust bean, galactomannan is now derived from the guar bean through a process developed originally by General Mills, yielding 35 to 40 per cent galactomannan.

It is claimed that galactomannan from the guar bean has improved the bursting strength, tear strength, and printability of paper; it has also increased clay retention as much as 50 per cent.

It is further reported that the substitution of guar gum for starches, which are used as a clay binder in surface coating, reduces the tendency of the paper to curl. This is of particular importance to manufacturers of fine paper grades where dimensional stability is required.

Defoaming

Foam has always been a serious problem in the paper industry. While no single defoaming agent can be used to solve all foaming problems and each problem must, therefore, be dealt with separately, a number of mills report successful and economical application of a non-ionic liquid defoamer sold by E. F. Houghton & Co. under the trade name "Di-Airex 510."

The advantage provided by liquid defoamers generally is that it is much easier to handle, is readily mixed with cold or hard water, and can be applied with automatic dispensers.

Animal glues and productivity

Animal glues are generally known to play an important role in increased productivity in paper mills. Animal glue is a complex chemical consisting of a range of protein fractions differing in molecular weight but all having the amphoteric properties imparted to the molecule by its free amino and carboxyl groups. These, combined with the colloidal nature of the protein, provide the properties for which animal glue is used in the paper mills.

Animal glues can now be obtained that are far superior to the glues produced in the past. In the new-process animal glues all quality factors are strictly controlled. Specific properties are imparted to the glue solutions by adding both aldehydic materials and polyvalent metal salts, such as aluminum sulfate, etc.

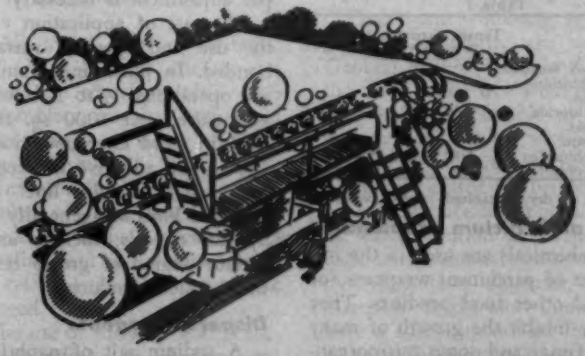
Chemically altered glue solutions are added in small concentrations to the head box of a paper machine as a flocculating agent to aid in the retention of clay, titanium dioxide, colors, fines, etc. Glue used in this manner quite often enables the paper machine to be operated at higher speeds, because better control can be obtained on ash, opacity, and brightness. The use of a glue solution as a flocculating agent in the headbox also helps improve sheet formation, generally resulting in a smoother and denser sheet with improved printing properties.

Chemically altered glue solutions are also used extensively as flocculating agents in flotation type save-all systems because of their ability to flock fibers and fillers, aid in obtaining clearer effluents, and assist in the recovery of valuable solids.

Animal glue is used extensively in the creping of facial and toilet tissue to aid in securing improved, uniform crepe and fewer rejects. Used in tub sizing and machine coating, it also helps to improve writability, printability, and "pick" test of certain types of paper.

Wet strength resin for surface application

Sold by du Pont under the trade name of TLF-563, this new wet-strength resin is applied either by spraying at the wet end of the machine or by tub sizing. With a 20 per cent treatment, a wet strength of 95 per cent of the dry strength of untreated paper is obtainable. A 10 per cent treatment gives 70 per cent wet strength; a 5 per cent treatment gives 45 per cent wet strength; and a 1 per



Foam remains the papermakers' scourge. The problem has been partly alleviated through the use of reinforced resins. There are also a number of defoaming chemicals available for general and specific applications.

cent treatment gives 25 per cent wet strength. The use of this resin also results in substantial increases in dry strength. A 20 per cent treatment, for instance, will give a 50 per cent increase in dry strength; a 10 per cent treatment increases dry strength by 30 per cent; and a 5 per cent treatment results in a 10 per cent increase of dry strength. The resin is also used as an insolubilizing agent for starch in water-resistant clear starch coatings, starch sizes, and in starch adhesive applications for use in pigment coatings.

An interesting application of the new resin is its use with the water-repellent stearato chromium chloride-complex. Laboratory study of such combination treatments shows that improved wet strength, dry strength, and water repellency can be obtained. This application may be particularly useful in such grades as ice bag paper or multiwall sacks where both water repellency and wet strength properties are of prime importance. The results of tensile strength test runs on sheets of 57-lb., 24 × 36 − 480, laboratory-made sheets are shown in Table I.

Table I

	Tensile Strength (lb/in.) Wet	%	Dry	%
3.0% TLF-563 Stearato chromic chloride 0.5% stearato chromic chloride 2.5% TLF-563 0.25% Stearato chromic chloride	9.68	51.2	27.3	144
	6.82	36.0	25.8	136
Untreated Control	0.0	—	18.9	—

*Percentage of dry, untreated control value.

Sodium and calcium propionate

These chemicals are used in the impregnation of parchment wrappers for butter and other food products. They effectively inhibit the growth of many types of fungi and some microorganisms over significantly long periods of time.

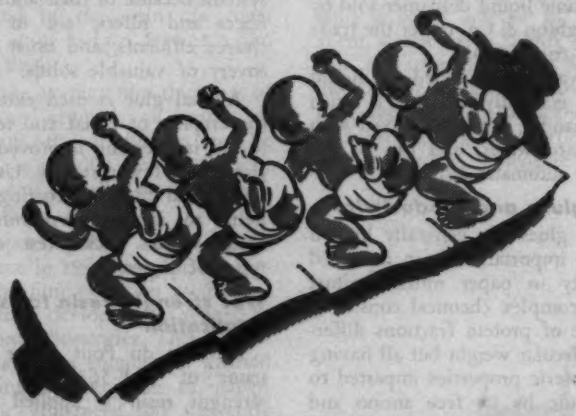
The same chemicals have already found application as mold and rope inhibitors in bread, cakes, pies, and other bakery foods and are also used for controlling mold in chewing and smoking tobacco.

Weatherproof adhesives

A weatherproof adhesive based on water-soluble vinyl resins has been developed to meet the specific need of the solid fiber industry. The adhesive shows many unique properties and advantages:

(1) It permits the production of a dry, firm fiberboard with low shrinkage.

(2) Since it is applied in extremely thin films and since the bond sets rapidly, high rates of production are made possible. On conventional solid fiber machines, speeds of 400 to 500 ft. per min. are obtainable.



There is no limit to the amount of absorbency desired in some paper applications.

(3) It provides immediate water resistance. Board made with this adhesive does not require aging to develop water resistance.

(4) It is a one-package adhesive. No catalyst, no preservative, and no pH adjustment is necessary.

The rate of application varies with the use and type of surface to be bonded. In most lining and laminating operations, ½ to 1 lb. of adhesive is required per 1000 sq. ft. of glue line. In solid fiber operations, 1½ to 1¾ lb. of adhesive are required per 1000 sq. ft. of glue line.

Dried films are generally unaffected by fats or oils, thereby imparting a certain degree of grease resistance to the bonded products.

Dispersing agents

A sodium salt of naphthalene sulfonic acid condensate is used as a versatile dispersing agent for a number of purposes, such as preventing pitch, coagulation, discouraging slime formation by keeping mill systems clean, obtaining better formation and retention of fines, and minimizing sticking at the presses.

Wetting and rewetting agents

Sulfonated polyesters of dicarboxylic acid are used to impart maximum absorbency to paper products. They can be added in the beater or at any convenient point in the papermaking system by spraying or dipping at the rate of 0.25 to 0.50 per cent of the dry paper. These wetting and rewetting agents have no objectionable odor and produce only a moderate amount of foam, which should make them suitable for application in high-speed continuous processing. They are reported to be stable in hard and soft water and in moderately acid or alkaline aqueous solutions.

Another type of wetting agent, outstanding in its effect of providing high absorbency in the presence of wet-strength resins and retaining this absorbency as the paper ages (see Table II) is the non-ionic wetting agent sold by E. F. Houghton & Co. under the trade name "Surfax 505." It is used at the rate of 3 to 4 lb. per ton of paper containing 0.5 per cent wet-strength resin and up to 6 lb. per ton of paper containing 1.5 per cent wet-strength resin.

Table II—Effect of "Surfax 505" vs. Competitive Material (Equal Costs Basis)

Days Natural Aging	Absorption Time — Seconds Surfax 505 6 lbs/ton	Competitive Material 8 lbs/ton
0	26	29
20	67	—
35	73	166
46	73	161
64	70	135
95	78	171
138	75	159

Improved paper softness

Amine sulfamates can be used more economically to provide superior softness combined with fire retardant properties in paper draperies, table cloths, towels, napkins, paper specialties, container papers, and paperboard products.

Results show that at the relative humidity of about 50 per cent, paper treated with a 40 per cent retention of various amine sulfamates is from 45 to 65 per cent softer than untreated paper. While the amine sulfamate treated papers absorb more moisture at low humidity than do glycerine treated papers, the softening action of

amine sulfamates does not seem to be dependent entirely on their moisture absorption property as in the case of glycerine. The sulfamates seem to have an additional effect of "lubricating" the fiber-to-fiber bonds. Combined, these two factors impart a superior softness to the paper and prevent it from drying out and cracking under low humidity conditions.

Fire retardant characteristics are obtained at 20 per cent retention of monoethanolamine sulfamate and monoisopropanolamine sulfamate, while a 30 per cent retention is required in the case of diethanolamine sulfamate.

The application of amine sulfamates is most satisfactorily carried out by immersion. Spray methods are also used successfully if the spray nozzles are adjusted to give a fine mist and even application over the paper surface.

Dyes and pigment colors

While it may not be immediately apparent how dyes and pigment colors contribute to increased productivity in the pulp and paper industry, the increased eye appeal of paper products due to coloring influences customer acceptance—and customer acceptance is among the important factors in the productivity index equation (See May Focus Issue of The PAPER INDUSTRY).

The current trend in paper dyes is toward continued improvement of color fastness, although color fastness is not too important a factor in paper products because of generally short-service requirement.

The value of dyes consumed by the U. S. paper industry is in the neighborhood of $20,000,000. Dyes are used in the paper industry at the rate of 3 oz. per ton in ordinary newsprint, 6 to 8 oz. per ton in colored newsprint, and about 8 oz. per ton in other papers based on over-all production.

Most of the basic colors used by the paper industry are manufactured in this country, but a small quantity of specialty dyes for special paper products are still being imported from Europe.

The amount of pigment colors used in the paper industry is estimated at about 10,000,000 lb. Color pigments are used where extra light fastness which is not obtainable by the use of basic dyes is required. Extra light fastness is required in heavy sheets for display windows, decorative papers exposed to light, twisting tissues ultimately converted into automobile seat covers, etc.

To obtain improved whiteness in certain paper products, especially bread wrappings, a noticeable shift from the use of anatase to rutile is apparent. Both are titanium dioxide pigments made from ilmenite; but rutile is the form of TiO_2 with the higher refractive index. The quantity of titanium dioxide incorporated in papers varies from ½ to 6 per cent, but some saturated papers for plastic laminates may contain as much as 15 per cent titanium dioxide. The content of titanium dioxide in bread wrapping paper is 5 to 6 per cent.

Felt washing

Alkyl phenoxy polyoxyethylene ethanols have been found extremely effective for removing various impurities and leaving the felt soft and absorbent. About 1 pound of the chemical is recommended per 50 gallons of liquor.

Recently the use of sulfamic acids for cleaning wet felts, press felts, wires, cylindrical molds, vats, pulp washers, and piping has developed rapidly. The advantages claimed for the use of sulfamic acids are as follows:

(1) All metal salts of sulfamic acid, including those of calcium and magnesium, are readily soluble. This assures complete reaction with hard water salts, sizings and fillers, and promotes rapid rinsing.

(2) Increased felt life has resulted in a number of cases, since sulfamic acid is less destructive to wool fibers than are other acid and alkaline cleaners. The felt is left soft and with the nap restored.

(3) The use of sulfamic acid is economically sound; it is an odorless, nonvolatile crystalline material supplied in 400-lb. wooden barrels.

Synthetic lattices

Synthetic rubber lattices are widely used by the paper industry for the purpose of upgrading pigmented coatings, which in turn upgrade all paper products so treated. Synthetic rubber latex has become a standard pigment binder and is used with casein, starch, soya bean protein, and glue to produce pigment-coated high grade papers.

Annual consumption of synthetic lattices is estimated at 15,000,000 lb. While greatest economy is provided through the use of styrene-butadiene type latex, butadiene-acrylonitrile latex is finding ever-increasing application in paper products where oil resistence and lack of odor are of prime importance, in addition to such properties as water resistance, increased tensile strength, elongation, stiffness, sizing resistance, and decrease in porosity, which are generally imparted to paper products by synthetic rubber lattices.

A variety of flame retardants is now available — although they do not prevent paper from charring, they will prevent flame-propagation.

The use of butadiene-acrylonitrile latex is becoming increasingly popular in the production of the heavily titanium dioxide-pigmented bread wrapping papers.

Optical whitening agents

Fluorescent whitening agents of exceptional solubility are supplied by General Aniline and Film Corp. under the trade name of "Blancophor HS". They make it possible to obtain extremely high whites without the risk of pulp degradation by overbleaching. They can be used for brightening boxboards by calender application, either in water solution or in combination with starch, methyl cellulose, carboxymethylcellulose, alginates, and other materials. While most fluorescent tints have a solubility of less than one per cent, the Blancophor's solubility of 10 per cent provides a certain advantage in handling and processing.

Bleaching with peroxides*

and the use of peroxide in waste paper recovery

A staff presentation

THE BLEACHING OF PULP with peroxides is one of the most important recent developments in the pulp and paper industry. This method is now being used commercially in the bleaching of groundwood, groundwood-sulfite mixtures, and sulfate pulps. In bleaching sulfate pulp, excellent results (88 to 90 G.E. brightness) are obtainable by applying the peroxide in the final caustic extraction stage and acidifying the hypochlorite treated pulp prior to adding the peroxide.

Peroxide bleaching is now practiced in nine sulfate pulp mills; and the groundwood peroxide bleaching process is in commercial operation in 25 pulp and paper mills with an aggregate daily output of about 1,200 tons.

Until recently it has been customary to bleach the sulfite fraction in a groundwood-sulfite mixture to a high brightness. It has now been discovered that it is more economical to bleach the groundwood fraction and mix it with unbleached sulfite pulp. This procedure has resulted in a saving of as much as $20 per ton to produce a groundwood-sulfite mixture suitable for rotogravure newsprint production.

It has also been found that pretreating the pulp with calcium chloride, sodium tripolyphosphate or chelating agents saves about 20 per cent of peroxide which otherwise may be lost in side reactions.

The estimated annual consumption of peroxide by the U.S. pulp and paper industry for bleaching purposes is 20,000,000 lb.

Some 70 to 80 per cent of the peroxides are used in the form of sodium peroxide which yields approximately 20 per cent of its weight as active oxygen and 103 per cent of its weight as caustic soda.

The recent drop in price from 28.7 cents to 25.7 cents for hydrogen peroxide (the 50 per cent solution contains 23.5 per cent active oxygen) will undoubtedly lead to increased use of hydrogen peroxide. The particular advantage of using hydrogen peroxide is in the fact that no undesirable by-products are formed, since water is the only residue.

The peroxide process for bleaching pulps involves four basic steps: (1) preparing the bleaching solution, (2) rapid and thorough mixing of the peroxide bleaching solution with the pulp in controlled proportions, (3) retaining the peroxide treated pulp long enough to permit the bleaching to go to completion, and (4) reducing and neutralizing the bleached pulp to the pH desired for any paper product. The operation may be carried out as a batch, semi-continuous, or continuous process.

The peroxide consumption is 0.84 — 1.68 per cent of hydrogen peroxide (50 per cent solution) or 1-2 per cent of sodium peroxide on the basis of dry pulp produced.

Preparation of bleaching solutions

The sodium peroxide solution can be prepared readily in a wide range of pH values by neutralizing the solution with an acid such as sulfuric, boric, or acetic. In order to obtain maximum recovery of the available active oxygen, the sodium peroxide should be added to the water slowly with vigorous agitation to prevent local over-heating which aids the decomposition of the peroxide.

Considerable heat is generated when sodium peroxide is dissolved in water, and more heat is produced when the solution is acidified. Since the sodium peroxide solutions become less stable with increased temperatures, it is recommended that the solutions be made up in as dilute concentrations as possible for any particular application, preferably in the 0.5 - 3.0 per cent concentration range. However, solutions of greater concentrations, up to 15 per cent of weight, can be made up satisfactorily if precautions are taken to dissipate the excess heat generated.

It is advisable to use the coldest water available and, under normal storage conditions, the temperature of the 2 per cent solution should not be allowed to exceed 80 to 90° F. Under average operating conditions the loss of active oxygen from sodium peroxide solutions can be kept at a minimum by the use of stabilizers such as Epsom salt or sodium silicate.

Contamination of sodium peroxide solutions with oxidizable or catalytic materials must be avoided since they cause appreciable loss of active oxygen. The water used should therefore be relatively free from organic impurities and from catalytically active minerals such as copper, iron, and manganese.

The bleaching solution of either sodium or hydrogen peroxide may be prepared in a batch or continuous operation. A typical layout for the batch preparation of a peroxide bleaching solution is shown in Fig. 1. The dissolving tank for a 100-ton-per-day bleaching process should have a capacity of 5000 gal. It should be made of stainless steel, tile, tile-lined concrete, tile-lined steel, or rubber-lined steel. The pointing cement for tile-lined tanks should be alkali-resistant and of

Table I

Chemical	H_2O_2 50% Formula Lbs./5000 Gal.	Na_2O_2 Formula Lbs./5000 Gal.	H_2O_2 50% Na_2O_2 Formula Lbs./5000 Gal.
Epsom Salt	20	20	20
41.6° Be Sodium Silicate	2000	2000	2000
"Solozone" Sodium Peroxide	—	800	400
66° Be Sulfuric Acid	—	560	—
100% Caustic Soda	400	—	—
"Albone" 50 Hydrogen Peroxide	672	—	336

*Based on information supplied by E. I. du-Pont de Nemours & Co.

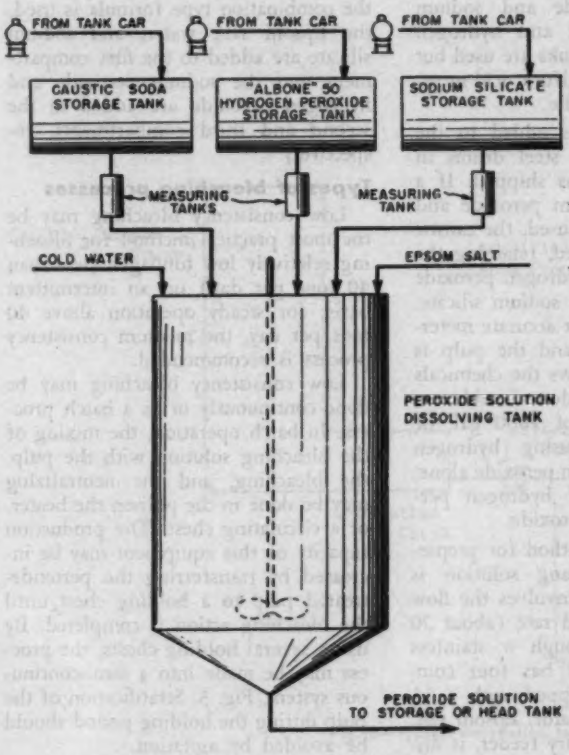


Fig. 1—Preparation of the peroxide bleaching solution

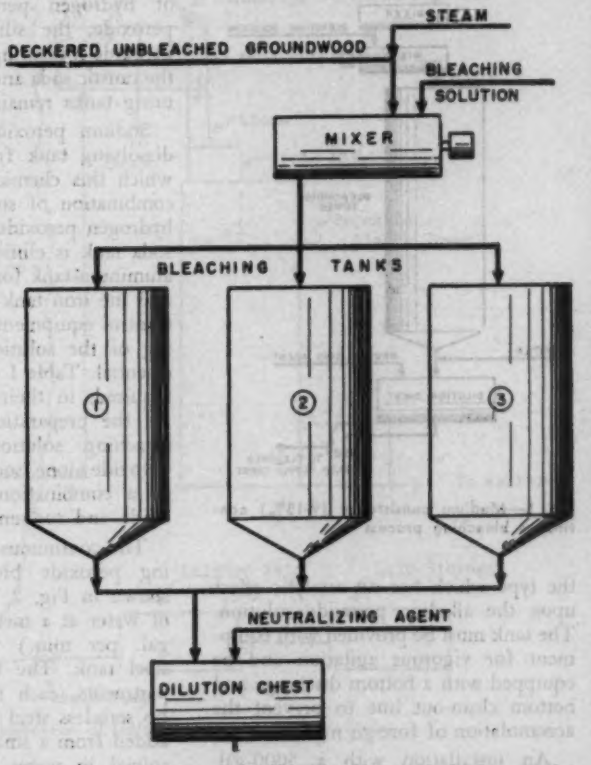


Fig. 3—Low consistency (4-6%) bleaching in multiple retention tanks

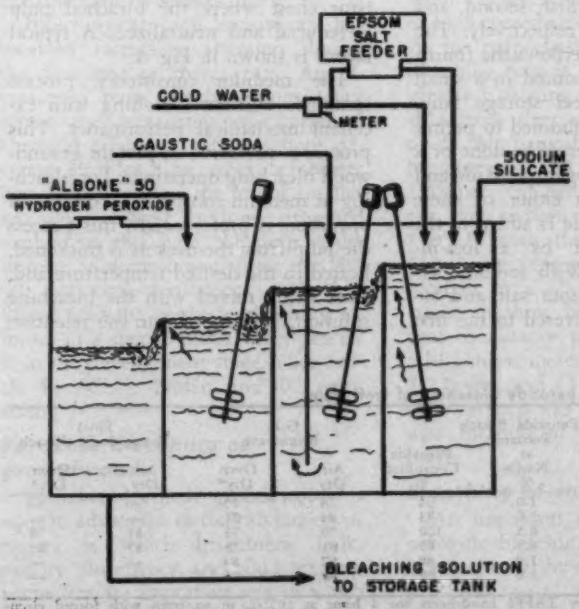


Fig. 2—Continuous preparation of the bleaching solution

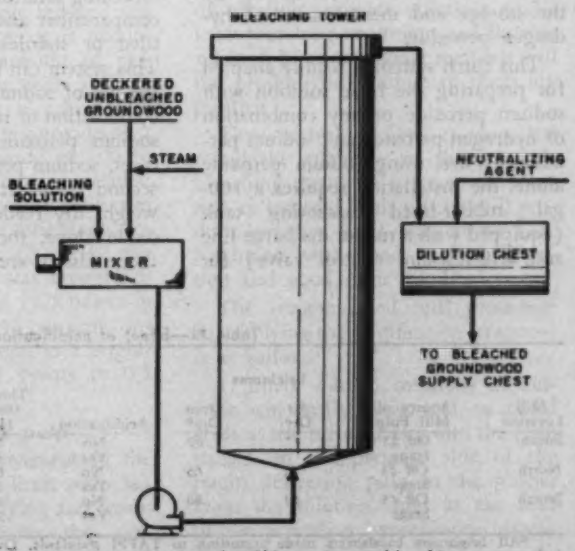


Fig. 4—Low consistency (4-6%) continuous bleaching process

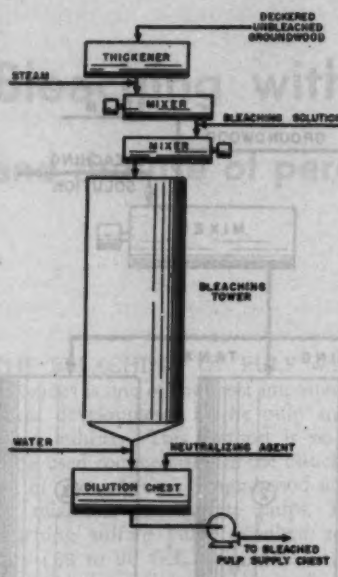


Fig. 5—Medium consistency (9-15%) continuous bleaching process

the type which has no catalytic effect upon the alkaline peroxide solution. The tank must be provided with equipment for vigorous agitation and be equipped with a bottom discharge and bottom clean-out line to prevent the accumulation of foreign matter.

An installation with a 5000-gal. dissolving tank should include a 400-gal. measuring tank for sodium silicate, a 100-gal. measuring tank for caustic soda, and a 100-gal. measuring tank for hydrogen peroxide. Measuring and storage tanks made of iron are suitable for caustic soda and sodium silicate, but aluminum tanks are required for the storage and measurement of hydrogen peroxide.

This batch system is readily adapted for preparing the basic solution with sodium peroxide or any combination of hydrogen peroxide and sodium peroxide. When using sodium peroxide alone, the installation requires a 100-gal. rubber-lined measuring tank (equipped with a rubber discharge line and acid-resistant control valve) for sulfuric acid; the measuring tank for caustic soda and hydrogen peroxide remain idle. When using a combination of hydrogen peroxide and sodium peroxide, the silicate and hydrogen peroxide measuring tanks are used but the caustic soda and sulfuric acid measuring tanks remain idle.

Sodium peroxide is added to the dissolving tank from steel drums in which this chemical is shipped. If a combination of sodium peroxide and hydrogen peroxide is used, the caustic soda tank is eliminated, retaining the aluminum tank for hydrogen peroxide and the iron tank for sodium silicate. Control equipment for accurate metering of the solution and the pulp is essential. Table I shows the chemicals required, in their order of addition, for the preparation of 5000 gal. of bleaching solution using hydrogen peroxide alone, sodium peroxide alone, or a combination of hydrogen peroxide and sodium peroxide.

The continuous method for preparing peroxide bleaching solution is shown in Fig. 2. It involves the flow of water at a metered rate (about 20 gal. per min.) through a stainless steel tank. The tank has four compartments, each equipped with a ¼ hp stainless steel agitator. Epsom salt, added from a small dry feeder, is dissolved in water by-passed from the meter and returned to the first compartment. The Epsom salt may be dissolved and added as a solution. Small proportioning pumps deliver the sodium silicate, caustic soda, and hydrogen peroxide to the first, second, and third compartments, respectively. The bleaching solution overflows the fourth compartment and is stored in a small tiled or stainless steel storage tank. This system can be modified to permit the use of sodium peroxide alone or a combination of hydrogen peroxide and sodium peroxide. In either of these cases, sodium peroxide is added to the second compartment by a loss-in-weight dry feeder. With sodium peroxide alone, the Epsom salt and sodium silicate are delivered to the first compartment and the sulfuric acid is metered into the third compartment by a small proportioning pump. When the combination type formula is used, the Epsom salt, water, and sodium silicate are added to the first compartment and the sodium peroxide and hydrogen peroxide are added to the second and third compartments, respectively.

Types of bleaching processes

Low consistency bleaching may be the most practical method for bleaching relatively low tonnages (less than 40 tons per day) on an intermittent basis; for steady operation above 40 tons per day, the medium consistency process is recommended.

Low consistency bleaching may be done continuously or as a batch process. In batch operation, the mixing of the bleaching solution with the pulp, the bleaching, and the neutralizing may be done in the pulper, the beater, or a circulating chest. The production capacity of this equipment may be increased by transferring the peroxide-treated pulp to a holding chest until the bleaching action is completed. By using several holding chests, the process may be made into a semi-continuous system, Fig. 3. Stratification of the pulp during the holding period should be avoided by agitation.

For continuous bleaching at low consistency, a mixer is used for blending the bleaching solutions with the pulp. The pulp is then pumped into the bottom of the launder-type retention tower and overflows into an agitator chest where the bleached pulp is reduced and neutralized. A typical layout is shown in Fig. 4.

The medium consistency process combines efficient bleaching with excellent mechanical performance. This process is preferred in present groundwood bleaching operations. For bleaching at medium consistency, continuous operation is preferred. In this process the pulp from the deckers is thickened, heated to the desired temperature and, after being mixed with the bleaching solution, is dropped into the retention

Table II—Effect of acidification on peroxide bleaching of kraft pulp

Mill Location	Source of Mill Pulp	Brightness Air Dry	Brightness Oven Dry*	Acidification	Peroxide Bleach Peroxide Time at 180°F. Hrs.	Peroxide Bleach Peroxide at Na_2O_2 %	Peroxide Bleach Peroxide Consumed %	G.E. Brightness Air Dry	G.E. Brightness Oven Dry*	Final Hypochlorite Bleach Air Dry	Final Hypochlorite Bleach Oven Dry*
South	Off #3 Stage	77	69	No	0.5	1.0	91	78	75	—	—
				Yes	3.0	1.0	85	84	81	—	—
North	Off #3 Stage	72	65	No	0.25	0.5	100	79	73	85	78
				Yes	1.25	0.5	65	83	78	87	82
North	Off #5 Stage	84	80	No	1.0	1.0	80	87	84	—	—
				Yes	2.0	1.0	80	88	86	—	—

*All brightness handsheets made according to TAPPI standards. Oven-dry TAPPI handsheets for 1 hour at 195°C. in an oven with forced circulation.

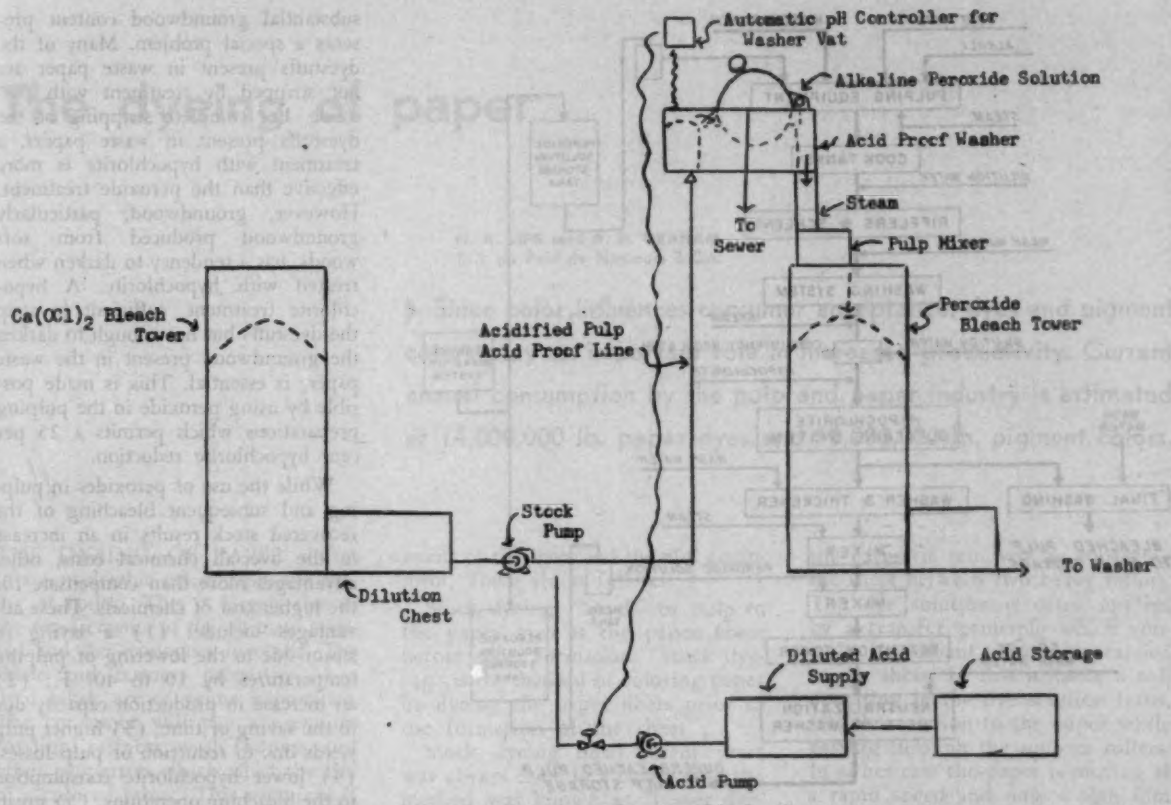


Fig. 6—Typical installation for acidification of kraft pulp

tower equipped with bottom discharge. The bleached pulp from the tower is conveyed to agitated dilution chests where the neutralizing and reducing agent is added. A typical layout for the operation is shown in Fig. 5.

Bleaching at high consistency has received increasing attention during the past two or three years. An increase in pulp bleaching consistency offers the advantage of improved chemical efficiency with resultant decrease in bleaching costs, a shorter bleaching time, and the use of smaller retention towers. In one proposed method of this type, the pulp is dewatered in a continuous press to a 30-40 per cent consistency and then mixed with the peroxide bleaching solution in a special mixer. This process is in the development stage. (See article by W. J. Nolan and B. Armstrong.)

Peroxide bleaching of groundwood

Peroxide-bleached groundwood is used to advantage in the production of papers in which brightness, bulk, opacity, absorbency, and good printing properties are important and in which high strength and long life are not essential. These papers include book, magazine, tissue, napkin, catalogue, directory, specialty papers, etc.

Groundwood may be bleached at low consistencies of 4-6 per cent, medium consistencies of 9-13 per cent, or high consistencies of 20-35 per cent. As the pulp consistency increases, the bleaching time is sharply reduced and greater bleaching efficiency is obtainable from the same amount of peroxide. Mechanical pulp with a G. E. brightness of 60 was bleached with 1.68 per cent hydrogen peroxide or 2 per cent sodium peroxide at 100 to 110° F. with the following results: (1) 5 per cent consistency pulp was brought to a 10-point brightness increase in three hours, (2) a 12 per cent consistency pulp was brought to a brightness increase of 11.5 points in 1.2 hours; and (3) a 35 per cent consistency pulp was brought to a brightness increase of 12.5 points in 0.5 hours.

Bleaching of sulfate pulp

An important improvement in the peroxide bleaching of kraft pulp has been achieved by acidifying and washing the pulp prior to the peroxide application. This improvement is due to the removal of residual lime and lime impurities which are carried in the pulp with cumulative effect from previous stages where milk of lime or calcium hypochlorite solutions have been used. The removal of these residues is necessary because lime and its impurities promote the decomposition of alkaline peroxide solutions under kraft bleaching conditions and because washing by conventional methods will not prevent the build-up of these impurities.

The removal of lime residues has raised the efficiency of the peroxide bleaching treatment in some instances five- or ten-fold. This process will produce bleached kraft pulp at 88 G.E. brightness with good strength retention and good color stability.

The recommended mill procedure for applying the acidification treatment is as follows:

1. Inject diluted solutions of sulfuric acid, hydrochloric acid, or mixed acids at the metered rate into the pulp stream on the pressure side of the pump delivering pulp to the washer from the dilution chest at the base of the preceding hypochlorite bleaching tower.

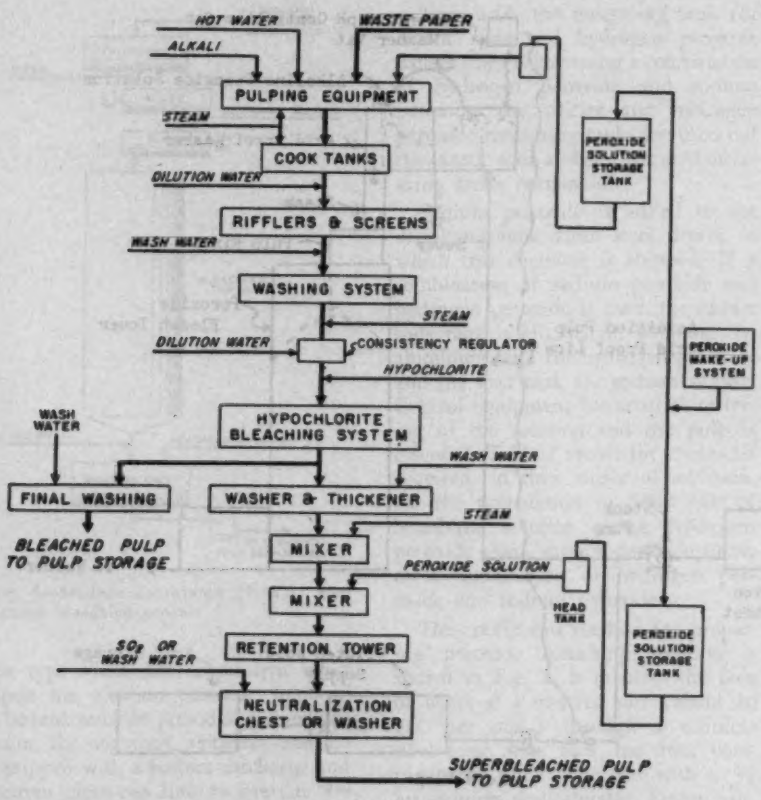


Fig. 7—Use of peroxides in the pulping and bleaching steps of waste paper recovery

2. Adjust the acid flow to control the pH of the slurry in the washer vat at the desired value. In general, the preferred pH range is between 2.5 to 3.5. The filtrate is sewered or diverted when possible to other uses in the mill.

3. The small amount of residual acidity in the washed pulp is neutralized by the alkaline peroxide solution in the subsequent stage.

The typical installation for this application is shown in Fig. 6, and the advantages obtained from the acidification pre-treatment and those of an additional bleach with hypochlorite are listed in Table 2.

Waste paper recovery

The higher groundwood content of printing grade papers has created new problems in waste paper recovery. Laboratory investigations, subsequently confirmed by commercial operations over the past four years, have shown that these problems can be overcome to a large degree by the use of peroxide in the waste paper recovery process.

In the peroxide pulping of waste papers, hot alkaline solutions are usually employed to loosen up the ink by saponifying the ink vehicle and to facilitate the defibering of papers by attacking the various binding materials. Alkaline peroxides catalyze hydrolysis reactions such as: (1) saponification of oils of the fatty acid glyceride type into glycerol and sodium salts of the fatty acid, both of which are water-soluble; (2) hydrolytic splitting of proteins, such as casein and glue, into water soluble salts of amino acids; (3) conversions of starch into a more readily water soluble form. Alkaline peroxide solutions, therefore, have greater tendency to attack the binding materials in waste papers than the corresponding caustic solution of equal alkalinity. Furthermore, both groundwood and chemical pulps are brightened by the action of alkaline peroxide solutions, whereas groundwood pulp will darken when brought in contact with alkalis in the absence of peroxide.

Bleaching of the fibrous materials recovered from waste papers with a substantial groundwood content presents a special problem. Many of the dyestuffs present in waste paper are not stripped by treatment with peroxide. For complete stripping of the dyestuffs present in waste papers, a treatment with hypochlorite is more effective than the peroxide treatment. However, groundwood, particularly groundwood produced from soft woods, has a tendency to darken when treated with hypochlorite. A hypochlorite treatment, sufficient to strip the dyestuffs but not enough to darken the groundwood present in the waste paper, is essential. This is made possible by using peroxide in the pulping preparations which permits a 25 per cent hypochlorite reduction.

While the use of peroxides in pulping and subsequent bleaching of the recovered stock results in an increase in the over-all chemical costs, other advantages more than compensate for the higher cost of chemicals. These advantages include: (1) a saving in steam due to the lowering of pulping temperatures by 10 to 40° F.; (2) an increase in production capacity due to the saving of time; (3) higher pulp yields due to reduction of pulp losses; (4) lower hypochlorite consumption in the bleaching operations; (5) greater uniformity, better color stability, and higher brightness of stock; and (6) lower consumption of pigments and/or bleached virgin pulps used for controlling paper brightness.

Commercial operations have shown that the use of 1 to 1.25 per cent of hydrogen peroxide or 1.25 to 1.5 per cent of sodium peroxide, based on the dry weight of waste paper, lies in the most practical range of concentrations.

The amount of alkali required to break down the binders and ink vehicles in waste papers depends upon other variables such as mechanical efficiency of pulping operations and the temperature and time in the pulping and cooking steps. In the presence of hydrogen peroxide about 3 per cent of caustic soda (based on the dry weight of waste paper added) is considered adequate for good results with magazine, book, and ledger papers. With sodium peroxide, which supplies its own weight of caustic soda, 1.5 per cent of sodium peroxide and 1.5 per cent caustic soda are equivalent to 1.25 per cent hydrogen peroxide and 3 per cent caustic soda.

A flow sheet of a typical peroxide system for the recovery of magazine

[Turn to page 596]

The dyeing of paper*

H. A. LIPS and D. P. GRAHAM
E. I. du Pont de Nemours & Co.

Since color influences consumer acceptance, dyes and pigment colors play an important role in increased productivity. Current annual consumption by the pulp and paper industry is estimated at 14,000,000 lb. paper dyes and 10,000,000 lb. pigment colors.

THE DYEING OF PAPER differs to a considerable extent from the dyeing of cotton. This is largely due to the requirements of the ultimate material and the economics involved. The shade and fastness properties of a dyed fabric are of prime importance. The consumer will pay a premium for light fastness, wash fastness, and other properties which affect the life of a colored fabric. This premium is sizeable when compared with the uncolored fabric.

Colored paper, on the other hand, generally does not have as severe service requirements, and many grades are single service use. Wash fastness is rarely an important factor. Light fastness, although important in many grades, is of minor importance in others. In most grades of colored paper a light fastness requirement of 6 hours Fade-O-Meter exposure is considered entirely adequate. The premium paid for colored paper over uncolored paper is generally less than 2 cents a pound. These reasons limit the dyes which are used and the cost of coloring the paper. Nevertheless, the dyeing of paper, although differing from the dyeing of cotton, is extremely important, since most paper is colored at least to some extent.

Paper dyeing is more empirical than cotton dyeing due to complexities of the system, particularly those arising from the variations in the chemical composition of the pulps.

How paper is colored

Paper may be colored by various methods depending upon the requirements of the sheet and the mill equipment. These are as follows:

Stock dyeing. "Stock" or pulp to the paper man is the paper fibers before sheet formation. "Stock dyeing" is the method of coloring paper by dyeing the paper fibers prior to the formation of the sheet.

Stock dyeing until recent years was always done in a beater, and the method was known as "beater dyeing". This term is still common but is somewhat a misnomer because many mills no longer have beaters. Probably 95 per cent of all colored paper is stock dyed.

Newsprint mills and the modern kraft mills in the South do not use beaters. The type of paper made by these mills does not require "beating". The stocks are mixed in large pulpers or chests and run through a series of continuous refiners. The sizing ingredients and dyes are metered continually into the system at some convenient point just before the pulp goes to the paper machine. This is known as "continuous coloring". It is a modification of stock dyeing.

Stock dyeing will be discussed in detail later, since it is the only true dyeing method; all other methods are simply staining or coloring procedures.

Surface coloring. Paper is often dyed by calender coloring, or surface staining at the size press. This procedure only colors the surface of the sheet. It can be used to color one side or both sides. It is used extensively on heavyweight paperboard. The paper is wet with a solution of the dye, in water, and the excess is removed by squeezing the sheet between two heavy rollers. The dye solution is often applied by a transfer principle which controls the amount of solution carried to the sheet. In this instance a roll operating in the dye solution transfers the solution to the paper while passing through the squeeze rollers. In either case the paper is moving at a rapid speed and only a thin film can be applied. It is possible to make two applications, but care must be taken not to wet the sheet excessively.

Dipping. Dipping is a conversion operation used to color tissue paper such as the decorative crepe party paper. The sheet of partially sized paper is actually dipped in a highly concentrated solution of the dye and then squeezed and dried.

Coating. Coating is a very important process in the finishing of paper. Coating is the procedure of covering the surface of the paper with a clay film held together with a binder. Starch and casein are the most important binders, and they can be used to bind a considerable amount of clay, TiO_2, or other pigments on the surface of the paper. Coatings equal to the weight of the paper are common. These coatings can be applied by a conversion process or directly on the paper machine. The coating mix can be readily colored with colored pigments or with soluble dyes.

Wood pulps. Wood pulp is the chief raw material of the paper industry. It varies in quality from waste paper, groundwood, and unbleached kraft pulps to high alpha bleached pulps. Wood pulp used in

*Presented at the meeting of the American Chemical Society, September, 1953 at the Conrad Hilton, Chicago.

making paper differs from cotton, as used by the textile industry, since it is less pure cellulose. Many of the pulps contain high percentages of lignin, hemicelluloses, gums, sugars, etc. There is a mechanical process, three important chemical processes, and a combination process known as the semichemical process for converting wood into pulp suitable for papermaking.

In dyeing paper the pulp must be carefully considered. It will influence color selection, shade, and the fastness properties of sheet. Unbleached pulps have a distinct shade of their own which has to be considered in matching a shade. The impurities in groundwood and unbleached pulps have a pronounced influence on the dyeing properties. Hardwood fibers are shorter and more bulky than softwood fibers. They have greater surface area per unit weight, and more dye is required to equal a given depth of shade than with softwood fibers.

The mechanism of color retention

Color selection and the mechanism of color retention depend upon the pulp to be dyed. In the case of bleached pulps we are dealing with cellulose; with unbleached pulps and groundwood we are dealing with lignin, hemicelluloses, and other noncellulosic components. Color retention in paper differs from the retention of dyes on cotton due to differences in the raw material, time, temperature, the presene of fillers, sizing agents, alum, etc.

In stock dyeing the pulps are blended and the dye is usually added dry, followed by rosin size. The dye and size are thoroughly mixed before the alum is added. If a filler is used, it may be added with the pulp or, in some cases, after the alum. The temperature of the beater is usually the temperature of the mill water supply, and in the winter this may be 40°F. Time in the beater depends upon the requirements of the paper machine. As the machine speed has been increased the time in the beater has been reduced. In many mills it is less than 30 min., which is very little time for dyeing, mixing, sizing, etc.

Direct dyes

Direct dyes which are substantive to cotton are also substantive to paper fibers, particularly bleached pulps. The degree of substantivity varies with the individual color; some are very substantive and are retained very well, while others are only partially substantive. Direct dyes are usually diazo or polyazo compounds solubilized by the presence of sulfo groups. They are substantive to cellulose due to the presence of properly spaced hydrogen bonding groups.

Substantivity of direct dyes for the fiber can be increased by heating the pulp and by the addition of salt. The pulp cannot, for economic reasons, be heated over 140°F. Even such a high temperature is rarely used because it will adversely affect the running of the sheet on the paper machine.

Direct dyes may be retained without size or alum. This is done in dyeing blotting and other absorbent papers. Alum, however, does aid the retention of direct dyes, and these dyes are retained better in a sized sheet. Sizing is normally carried out at a pH between 4.5 and 5.5 Direct dyes are duller and have poorer light fastness at a pH below 5.5 in the presence of alum than they do at a pH of 6.5 and over. This is an important reason why most direct dyes have poorer light fastness when dyed on paper than they have when dyed on cotton. In the case of some colors such as benzopurpurine, soda ash and/or sodium aluminate are used to raise the pH, so that the color may be dyed at a pH of 6.5 and obtain the true bright shade of the color. It is more difficult to size at this high pH with rosin size; therefore, this procedure is not used except where absolutely necessary. Considerable work is now being done with new sizing agents which will make it possible to size at pH values above 7. This will increase the emphasis on direct dyes, and the result will be better brightness and light fastness from the same colors.

Basic dyes

Basic dyes are colored molecules containing basic quaternary ammonium groups. They are substantive to acidic materials such as the tannins and lignins in the non-cellulosic impurities in unbleached pulps and in groundwood. Basic dyes have relatively no affinity for pure cellulose and bleached pulp, but are retained readily on unbleached pulps and groundwood. The bond that is formed by basic dyes with the non-cellulosic components is strong enough to render the dye relatively fast to water bleeding if the paper becomes wet.

Basic colors dye unbleached fibers rapidly and, therefore, work very well in continuous coloring on this type of pulp. Since they have a strong preference for unbleached pulps, basic dyes must be used with caution on mixed furnishes. If Victoria Green were dyed on a furnish of 80 per cent bleached sulfite and 20 per cent unbleached sulfite, the sheet would be severely granited with essentially all of the color on the unbleached fibers.

The affinity of basic dyes for bleached pulps may be materially increased by the addition of a mordant. Mordants such as tannic acid, or a combination of tannic acid with tartar emetic, and the synthetic mordants made by condensing phenol and sulfur are used. One of the most effective mordants for basic dyes on bleached pulps is the sodium salt of the formaldehyde condensation product of naphthalene sulfonic acid. This mordant, however, must be used with size and alum to be most effective.

Basic dyes are economical, bright, and tinctorially strong. The light fastness of these dyes is generally poor. Light fastness, however, is often not an important requirement of colored paper. Basic dyes are an extremely important class of paper colors.

Dyes bound to the fiber by mordant

Acid dyes are also important paper colors. These dyes have little affinity for either bleached or unbleached pulps. They are used extensively in calender coloring and dipping and are retained in the sheet in stock dyeing by the size and alum.

Acid dyes are colored molecules solubilized by sulfo groups. They are usually anthraquinone or monoazo compounds of relatively low molecular weight and are substantive as anions to basic materials such as fibrous proteins (wool, etc.).

These dyes are retained in stock dyeing only by the mordanting action of the rosin size-alum complex. The retention of acid dyes is, therefore, closely associated with sizing, and optimum retention is within the pH range of 4.5 to 5.5. The degree of retention is generally a function of dye solubility. Acid dyes with lower solubility are retained very well, but those having extremely good solubility, such as Tartrazine (C.I. 640) and Orange G (C.I. 27), cannot be retained in a stock dyed sheet.

Acid dyes, even under optimum conditions, are loosely bound to the fiber and the tray waters draining through the fourdrinier wire are generally highly colored. Because these dyes have so little affinity for either bleached or unbleached fibers, they

generally produce level dyeing without graniting (selective fiber dyeing). The bond to the fiber is weak particularly in the undried sheet. If the wet sheet comes in contact with an extremely hot drier on the paper machine, the color will "burn", that is to say, it will migrate away from the heat of the drier. This is particularly true of the more soluble colors and in heavier weight papers where more heat is required to dry the sheet.

Some new mordants, largely resinous types, are available which can precipitate acid and direct dyes. These mordants essentially form large insoluble color complexes which behave as pigments. Invariably these products result in increased retention, less bleeding, and more two-sideness.

Pigments

The paper industry is a large consumer of white and colored pigments. Most of these pigments are treated by the pigment manufacturer to render the pigment water-dispersible. Pigments have no affinity for the fiber. They are retained by the action of the alum, and size and alum.

Most pigments used by the paper industry are negatively charged and are repelled by the negatively charged cellulose. The positive trivalent alumina ion flocculates the dispersed pigment particles and neutralizes the charge on both the pigment and the fiber suspension, causing mutual attraction.

Alum is, therefore, an effective mordant for retaining pigments in the sheet. Pigmented sheets, particularly when made with alum and a wet strength agent, are often fast to water bleeding and even a soap washing, depending upon the pigment being used.

Specialty colors for paper

The majority of dyed paper is colored with direct, basic, acid, or pigment colors. In some cases, sulfur colors, naphthanils, and even vat dyes are used. The processes for applying these dyes are modifications of the regular textile procedures to fit in with the papermaking process.

The sulfur color dyeing procedure is the most interesting. The sulfur color is usually added to the beater dry, together with the minimum amount of sodium sulfide to temporarily solubilize the dye. After the color and sulfide are thoroughly mixed and dissolved, one and one-half parts of zinc chloride is added for each part of sodium sulfide. The zinc chloride is added to reset with the sodium sulfide to form zinc sulfide and at the same time neutralize the beater. The color is exhausted on the fiber and becomes part of the fiber and cannot be washed free. Sulfur colors are used only occasionally where special water bleed fastness and light fastness requirements are desired.

This special procedure was developed because the normal textile procedure was impractical for use in the beater. A beater containing the necessary amount of sodium sulfide to solubilize the dye is alkaline and would rapidly liberate hydrogen sulfide fumes if acidified. This would happen as soon as the alum was added. The beater is open and the fumes could not be tolerated in the beater room. Zinc chloride eliminates the fumes and speeds up the process. In a textile mill the dyeing can be washed and soaped. This is impractical in a paper mill; and, therefore, special procedures had to be developed for this industry.

Naphthanil colors may be beater applied or surface applied. In either case a two-step process is required. Surface coloring with Napthanil colors is essentially limited to conversion coloring on supplementary machines. The prepare is applied first, allowed to penetrate into the surface of the sheet, and followed by the diazo coupling component.

Vat colors ore limited to specialty grades at the present time. Most vat colors used by the paper industry are used as dispersed pigment colors where light fastness and durability are prime considerations. Vat colors have been applied in the beater by the alkaline reduction method, as well as by the acid leuco procedure with very good success. In each case the color is air oxidized onto the fiber. Pulp dyed with reduced vat colors shades having excellent fastness properties.

Function of sizing

The end use requirements of most paper necessitates some degree of water resistance. This is known as sizing. The exceptions are blotting, napkin, facial tissue, and other absorbent papers. The most important sizing agent used by the paper industry is rosin size. This is a rosin soap which is used in conjunction with papermakers alum (aluminum sulfate). Alum is necessary to obtain good sizing and has a major influence on the dyeing procedures.

The rosin particles have a negative charge and react with the trivalent positively charged alumina ion and are flocculated onto the fiber. Alum reacts further to harden and insolubilizes the deposited size which presumably envelopes the color. It also hardens the natural sizing agents that are still present in the pulp. These natural sizing agents are frequently used to advantage to reduce the amount of rosin size required. Starch, natural gums, and synthetic resins are frequently used as supplementary sizing agents. At times wax emulsions are also used, but rosin size is by far the most important and has the greatest influence on color retention.

Color selection

Color selection is of prime importance, and the man in charge of coloring should be familiar with the economics and fastness properties of all of the important paper colors. The end use of the paper will determine what colors are used. Many grades of paper have no particular fastness requirements, and economy is the chief consideration.

Basic dyes are the cheapest class of colors that can be used and are given first consideration for groundwood and unbleached kraft pulps. The acid oranges, Orange II Conc. (C.I. 151) and Orange RO (C.I. 161), however, are brighter and cheaper than basic colors for orange shades. Benzopurpurine (C.I. 448) and Congo Red (C.I. 370), despite the fact that they are sensitive to acid and must be dyed at a pH of 6.0 or higher, are extensively used in paper dyeing because they are economical for deep red shades. Each shade is a separate problem, and only experience and knowledge will assure using the correct dyes to meet the requirements of the sheet.

Paper dyeing problems

Light fastness. The light fastness requirements of a sheet of paper are rarely as severe as the requirements of a colored fabric. A 6 hour Fade-O-Meter exposure is considered an adequate measure of light fastness for bond and cover papers. Some grades of paper such as twisting tissue for automotive seat covers and paper rugs have requirements of 200 hours and over. Long exposure such as this on cotton would necessitate the use of vat dyes, whereas on paper pigments are used for cost reasons.

Alkali fastness. Alkali fastness is important only in soap wrap papers

and papers which will come in contact with alkaline adhesives. Brilliant Paper Yellow (C.I. 364) turns to a brilliant red when spotted with 1 per cent caustic solutions; nevertheless, it is an important paper color. It is used in grades where alkali fastness is not important.

Acid fastness. Resistance to acids is important in relatively few grades of paper such as citrus wrap. Therefore, acid sensitive colors such as Benzopurpurine and Congo Red can be used.

Bleach fastness. Fastness to bleach is important only in ledger papers where fastness to ink eradicator is desired. Some mills prefer to use only dyes that are readily destroyed by a mild bleach. If such dyes are used,the "broke" or colored trim from the paper machine can be bleached and re-used in other shades.

Water bleed fastness. Wash fastness is rarely required in a sheet of paper, but resistance to wet bleeding is a common requirement. Direct dyes on most pulps and basic dyes on unbleached pulps are generally sufficiently fast. Pigments are used to meet the most rigid water bleed requirements. Acid dyes, however, should not be used if water resistance is desired.

Two sidedness. This is a term used to describe a common condition encountered in colored paper where one side of the sheet is more heavily colored than the other side. The deeper side is usually the "top" side of the sheet unless the furnish contains a high percentage of white filler. The "top" side of the sheet is the side that was up when the sheet went over the fourdrinier paper machine.

The wet paper sheet on the fourdrinier wire passes over the table rolls, suction boxes, and a suction couch roll. All these devices help remove water from the sheet. In so doing water is sucked from the bottom side of the sheet taking with it fibers, fillers, sizing agents, etc. The fourdrinier wire is in effect a fractionating screen removing the fine particles that will pass through the openings. These are drawn away from the bottom side of the sheet. If pigments are used in the furnish the sheet will always have more pigment on the top side than on the bottom. If the pigment is a colored pigment, the top will be a much deeper shade than the bottom. If the pigment is a white pigment, the two-sidedness will depend upon the relative affinity of the soluble dye for the fiber or the pigment.

The pigment most frequently encountered in colored paper where two-sidedness is important is clay. Some colors, such as Stilbene Yellow types, have a natural affinity for clay, and in a furnish containing this filler, are selectively absorbed on clay in preference to the fiber. The sheet in this instance would be deeper on the top side. Brilliant Paper Yellow (C. I. 364), on the other hand, has no affinity for clay, and a filled sheet containing this dye is deeper on the "wire" or bottom side. In a filled sheet a careful selection of color is necessary to produce an even sided sheet.

Wood pulp is composed of long and short fibers. The long fibers are the support fibers of the tree. The "fines" are concentrated around the ray cells that form the food passages in coniferous woods. The fines contain a higher percentage of resins and other impurities than are present in the "longs". This is true even after bleaching. It is possible to reduce the alcohol-ether extractibles of wood by simply screening the pulp to remove the fines.

The majority of the soluble dyes used to color paper have a preferential affinity for these impurities and will dye the fines a deeper shade than the longs. The reasons for this selective affinity are not clearly understood since the degree varies with different colors. It is conceivable, however, that the degraded cellulose, present to a greater extent in the fines, might have more effective hydrogen bonding groups than the relatively purer cellulose in the longs.

In forming the sheet of paper on the fourdrinier paper machine wire the fines behave as pigments. They are sucked through the wire openings away from the bottom side of the sheet. The longs form a mat resulting in a higher concentration of fines on the top surface. The average dye, since it has dyed the fines deeper than the longs, will be two-sided. The degree of two-sidedness is increased with machine speeds necessitating more suction to remove the water and thereby removing more of the fines. These fines are simply recirculated causing a greater build up on the top of the sheet.

There are very few dyes which can be considered non-two-sided dyes. The outstanding dyes are:

Dye	Class	C. I. No.
Crocein Fl	Acid	P.R...148
Ruby PL	Acid	179
Brilliant Paper Yellow	Direct	364
Anthraquinone Blue B	Acid	1054
Quinoline Yellow	Acid	801

It is possible to reduce the selective preference of direct dyes and some acid dyes for the fines by the use of certain dispersing agents. The sodium salt of the formaldehyde condensation product of naphthalene sulfonic acid, and some of the lignin sulfonates, if added before the dye, will materially reduce two-sidedness. Some mills are using this technique with considerable success. Another procedure for correcting two-sidedness is to surface-stain the bottom side of the sheet with a dilute dye solution to mechanically balance the sides.

Experimental mill runs have been made on blue and green bond using vat dyes reduced and reoxidized onto the fiber to study two-sidedness. These colors in the laboratory showed a preference for the "longs" and, therefore, were of interest for mill trial. The paper which was produced at high speeds was essentially non-two-sided. Cost, however, has hindered the introduction of vat dyes for bond papers.

The dyeing of paper although differing considerably from the dyeing of cotton is, however, an interesting and important subject. There is room for considerable constructive work to improve the technique of coloring to keep abreast of the new advances in papermaking. This is a challenge to the chemist and technical men in the industry.

References

1. Casey, James P., "Pulp and Paper—Chemistry and Technology," Vol. 1: pages 468-489.
2. Laughlin, E. R., *The Paper Industry*, 24, Nos. 5, 6, and 7: pages 499-502; 600-603; 709-711, August, September, and October, 1942.
3. Craig, F. A., *World's Paper Trade Review*, 133, No. 13: pages 859-867, March 30, 1950.
4. Kress, O. and Loutzenheiser, E. J., *Paper Trade Journal*, 114, No. 11: pages 133-136, March 12, 1942.
5. Cornely, B., *Zellstoff U. Papier*, 18, No. 4: pages 192-194, April, 1938.
6. Sigvardt, C. M., *Paper Maker*, 110, No. 6: Tech. Section, pages 55-61, December, 1945.
7. Soderberg, F. A., *Paper Trade Journal*, 97, No. 21: pages 251-252, November 23, 1933.
8. Chalon, O. T., *Paper Trade Journal*, 104, No. 1: page 26, January 7, 1937.
9. Rose, R. E. and Schmidt, J. C., *Paper Trade Journal*, 101, No. 5: pages 55-58, August 1, 1935.
10. Keaton, J., *Paper-Maker*, 93, No. 4: Tech. Section, pages 57-64, April, 1938.
11. Harrison, W. D., *Paper Trade Journal*, 105, No. 13: pages 179-185, September 23, 1937.
12. Lips, H. A., *Tappi*, 33, No. 12: pages 603-608, December, 1950.

Neoprene-treated paper's new look

Half-hour in washer ruins ordinary seat cover fabric; neoprene-treated is intact

IN THE LAST FIVE YEARS much progress has been made in improving the properties of paper by the addition of relatively small amounts of resin and elastomers. One of the interesting elastomers now brought to the attention of papermakers is a newly developed polymer of neoprene. Neoprene's remarkable resistance to the deteriorating effects of oil, gasoline, and grease, as well as its ability to withstand heat, oxidation, and exposure to sunlight and the weather, makes it suitable for use under many unique service conditions.

Neoprene is used in latex form by the paper industry. This is a milky fluid which consists of negatively charged neoprene particles. Neutralization of the electric charge on the neoprene particles will cause coagulation of the latex. The particles may be coagulated in the presence of fibrous materials such as cellulose. These properties and the development of a new type of neoprene latex and special coagulation procedures have now made it possible to incorporate neoprene into paper. The new latex is an alkaline, aqueous dispersion of polymerized 2-chlorobutadiene 1,3. It has a pH of about 12 and a total solids content of approximately 35 per cent.

The process consists in sensitizing the latex with a dispersion of aluminum sulfate. The sensitized latex, together with the anti-oxidant and the zinc oxide, is added to the pulp during stock preparation and is co-precipitated with the fiber by means of alum.

Another method of combining neoprene latex with cellulose is by the so-called saturating technique in which the formed sheet is dipped into a latex composition and allowed to absorb the desired amount of neoprene. Amounts of neoprene in excess of 10 per cent of the weight of paper are usually applied by the saturating technique.

Improvements achieved

The improvements imparted to paper through the addition of neoprene by either method are as follows:

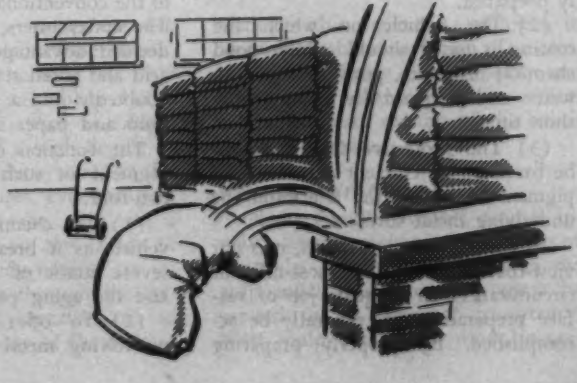
Improved tensile strength. While the addition of small amounts of neoprene to paper results in relatively little increase in its dry tensile strength, remarkable improvements in wet-strength do result. Thus, an addition of 2 per cent of neoprene to paper results in a 10 per cent increase in dry-strength and a 500 per cent increase in wet-strength, as shown in Table I.

Improvement in elongation. The addition of small amounts of neoprene to kraft paper results in a substantial increase in elongation in both the machine and the cross-machine directions. Thus, the addition of 2 per cent neoprene to a 60-kraft bag paper resulted in 30 to 33 per cent elongation increase, and the addition of 17 per cent neoprene to kraft paper gave an elongation increase of 165 per cent. The latter was accompanied by 270 per cent elongation increase in the cross-machine direction.

Table I—Tensile strength (lbs. per in. width)

% Neoprene Added	Dry	Wet	% Wet Tensile Strength Wet x 100 / Dry
0	50	3	6
1	53	10	19
2	55	19	34.5
3	56	24	43

Improvement in bursting strength. The addition of neoprene results in substantial wet and dry bursting strength increases. This is not surprising since the bursting strength of paper is closely correlated to tensile strength and elongation.



Resilience and bursting strength are two important properties imparted to paper products by neoprene.

Improvement in impact and shock resistance. The improved resilient characteristics of neoprene-treated papers undoubtedly will be reflected in improved bag properties so as to minimize drop breakage.

Improvement in folding endurance. The addition of neoprene to paper also produces a marked improvement in the paper's folding endurance. This is an important property in paper products which are subjected to considerable folding during their service life.

Scuff resistance. Neoprene improves scuff resistance of the paper under both wet and dry conditions. The improvement in wet scuff resistance should open many new uses for paper or paperboard.

Improved resistance to chemicals. Neoprene-treated paper retains its strength to a greater extent than does untreated paper or conventional wet-strength paper when placed in contact with various chemical solutions, as shown in Table II.

Internal bond strength. The addition of neoprene improves internal bond strength. This increases the value of paper for such products as gaskets, shoe insoles, shoe counters, and masking tape base.

Some specific applications

It is believed that the greatest impact neoprene will have on the development of paper products is that of imparting unusually high wet-strength and elastic properties. These advantages have already aroused the interest of various paper bag manufacturers. We are informed that the first factory scale run of neoprene treated multi-wall kraft bags has recently been completed by the Union Bag and Paper Corp.

The development of a new paper fiber yarn reinforced with neoprene is bringing paper fiber seat covers back into competitive production. The seat covers made from neoprene-treated paper fiber can be sponged clean and show generally improved resistance to fraying and pulling apart when wet. The wet strength resistance of neoprene-treated fiber is illustrated in Fig 1.

Table II

	Wet-Strength		
	Control	Resin	Neoprene
Water	Broke immed.	72 hrs.	86 hrs.
10% HCl	Broke immed.	6 min.	4 hrs.
10% NaOH	Broke immed.	6 hrs.	72 hrs.

Neoprene-treated filter papers are finding increased use in the petroleum refining industry, especially in the filtration of used lubricating oils which is carried out at temperatures up to 275°F.

In the filtration of 10 per cent mineral acid solutions, neoprene-treated filters have been used for as many as 10 filtration cycles compared to the single cycle endurance of untreated paper.

An improved backing for pressure-sensitive stickers has been made possible through the use of neoprene. Neoprene more than doubles the internal bond strength of the backing paper, thus eliminating the splitting problem encountered when the sticker is peeled off the backing immediately prior to use.

Anti-corrosive paints in the pulp and paper industry

JOHN J. OATES
Chief Chemist
Subox Inc.

PROTECTING METAL STRUCTURES and equipment in and around pulp and paper mills has always posed difficult problems to the paint formulator. The variety of chemicals used and the excessive humidity and wetness generally prevailing in this process industry requires that a serviceable protective coating meet rigid specifications:

(1) It must have good adhesion to a variety of surfaces and must maintain that adhesion even when the surface to be painted is not ideally prepared.

(2) The vehicle on which the coating is based should exhibit good chemical resistance, good resistance to water, and it should dry in reasonably short time.

(3) The protective system should be based on an efficient anti-corrosive pigment to inhibit the attack on the underlying metal surfaces.

As for surface preparation, it is our view that even under the most difficult circumstances an adequate job of surface preparation can generally be accomplished. By properly preparing and drying a small area (often with the aid of a blow torch) and immediately applying the prime coat to that area, the total job can be finished in a series of steps. This procedure minimizes the danger of poor adhesion due to surface contamination during the critical period between cleaning and painting and insures against under-film corrosion.

New vehicles have recently been developed that show considerably improved chemical resistance, water resistance, and speed of drying compared to the conventional oleoresinous types. The epoxy esters, in particular, show decided advantages in adhesion and acid and alkali resistance and will undoubtedly find a ready market in the pulp and paper industry.

The function of the anti-corrosive pigment in such a paint system is two-fold:

(1) To chemically reinforce the vehicle as it breaks down under the severe attack of moisture, chemicals, and the aging process.

(2) To offer protection to the underlying metal surface, when corrosive agents break through the film. This situation is bound to develop eventually, since no organic coating is completely impermeable to moisture and chemical solutions.

The reinforcement of the vehicle is attained by the use of pigment that, by virtue of its chemical activity, combines with and utilizes the destructive decomposition products resulting from vehicle breakdown. The net result is that the protective coating is preserved in the original tough flexible condition for an indefinite period of time and does not fail prematurely due to embrittlement, cracking, or peeling. These neutralizing actions lead to the formation of soap products (specifically lead soaps) in the film. These lead soaps, together with the inherent anti-corrosive properties of the pigment itself, have the combined effect of inhibiting corrosion at the metal surface.

Based on the principles outlined here, coatings are now designed for just such conditions as prevail around digester tanks, bleach tanks, conveyor equipment, air ducts, and similar equipment.

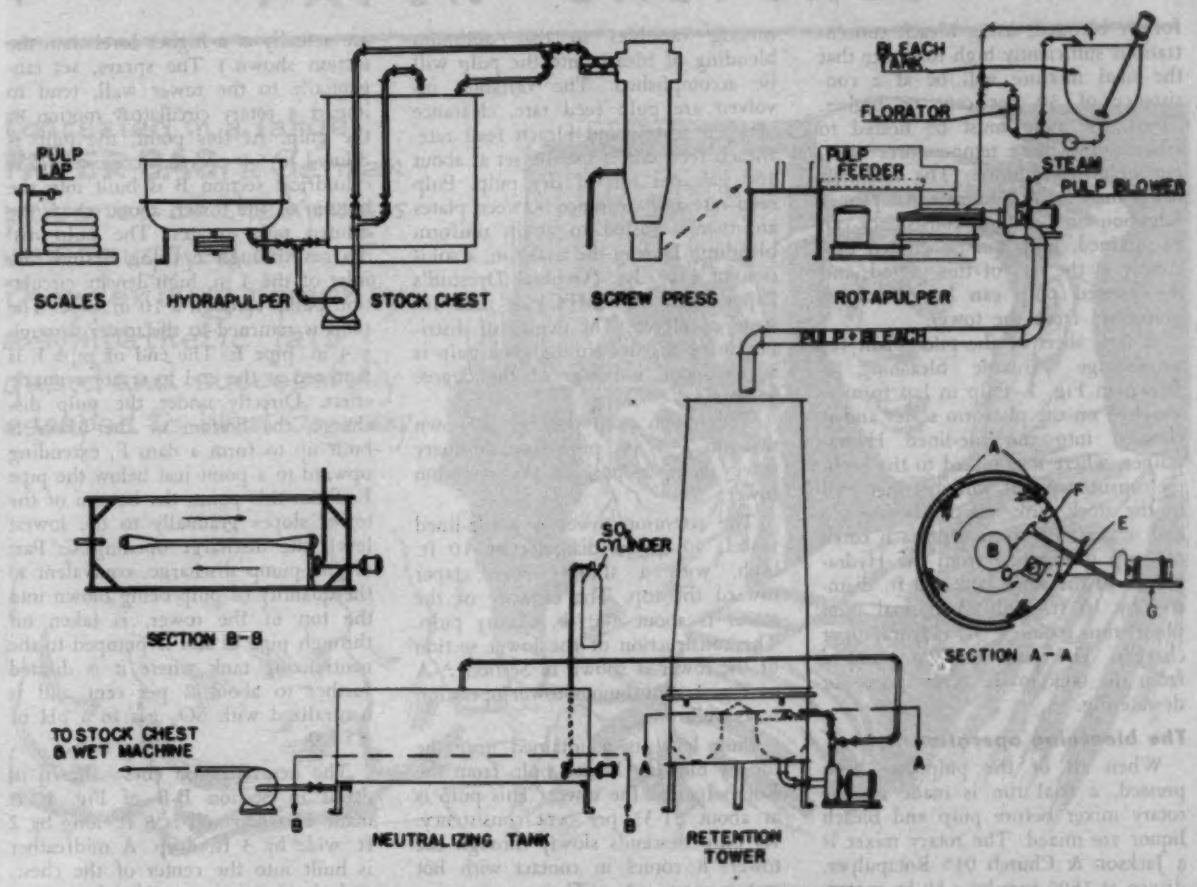


FIG.1 FLOW SHEET FOR HIGH DENSITY BLEACHING
PULP & PAPER LABORATORY UNIV. OF FLORIDA

Ultra high density peroxide bleaching*

WILLIAM J. NOLAN† and BRUCE ARMSTRONG‡

IT HAS BEEN FOUND that groundwood of chemical pulps can be bleached successfully at consistencies of 30 to 35 per cent of the final mixing.

The heart of the high density process lies in a high speed rotary mixer which thoroughly blends pulp and bleach liquor. The pulp, at about 40 per cent consistency, passes between a pair of toothed plates (one stationary and the other rotating at 1800 rpm). Since the rotary plate has a diameter of 28 in., the centrifugal forces set up are of a high degree of magnitude. The combing action of the meshing teeth creates ever-changing surfaces throughout the pulp. At a precalculated point on the radius of the plates, three spray nozzles are inserted concentrically through the stationary plate. The nozzles are so placed that the velocity of the moving teeth in this region is sufficient to atomize the bleach solution. The combination of finely divided spray and very rapidly changing fiber surfaces insures intimate mixing of the solids and liquid phases.

Pulp preparation

Obviously, the over-all process involves several mechanical treatments of the pulp, not normally used in the pulp mill. First, the pulp must be pressed to 40 per cent consistency. Next, pulp and bleach must be uni-

*From a paper presented at the June, 1954, meeting of the American Pulp & Paper Mill Superintendents Association.

†Professor of Chemical Engineering, University of Florida.

‡Technical director, Jackson & Church Co.

formly blended, using bleach concentrations sufficiently high to insure that the final mixture will be at a consistency of 30 per cent or higher. Third, the pulp must be heated to efficient bleaching temperatures without excessive dilution. The retention tower must be so designed that proper retention time at high consistency can be attained, pulp can be diluted uniformly at the end of this period, and the diluted pulp can be discharged uniformly from the tower.

A flow sheet of the pilot plant for single-stage peroxide bleaching is shown in Fig. 1. Pulp in lap form is weighed on the platform scales and is charged into the tile-lined Hydrapulper, where it is mixed to the highest consistency that will still mix well in the stock tank, usually between 3 and 4 per cent, oven dry. Each batch of pulp is pumped from the Hydrapulper to the stock tank, 10 ft. diameter by 10 ft. high. A normal pilot plant run requires 5-7 Hydrapulper charges. The pulp is then pumped from the tank to the screw press for dewatering.

The bleaching operation

When all of the pulp has been pressed, a trial run is made on the rotary mixer before pulp and bleach liquor are mixed. The rotary mixer is a Jackson & Church 015 Rotapulper, driven at 1800 rpm by a 50 hp motor. The trial run is needed to fix the mixing variables so that optimum blending of bleach into the pulp will be accomplished. The variables involved are pulp feed rate, clearance between plates, and bleach feed rate. Bleach feed rate is usually set at about 150 gal. per ton of dry pulp. Pulp feed rate and clearance between plates are then adjusted to attain uniform blending. During the trial run, a solution of blue dye (General Dyestuff's Paper Pure Blue MFC) is used instead of bleach. The degree of distribution of the dye through the pulp is a very good indicator of the degree of mixing.

The bleach pulp mixture is blown through a 5 in. pipe line, ordinary stove pipe sections, to the retention tower.

The retention tower is a tile-lined vessel, 40 in. in diameter by 10 ft. high, with a slight inward taper toward the top. The capacity of the tower is about 400 lb. of dry pulp. The construction of the lower section of the tower is shown in Section A-A of Fig. 1. Continuous tower operation is as follows:

Pulp level is maintained near the top by blowing heated pulp from the Rotapulper to the tower. This pulp is at about 31-33 per cent consistency. As pulp descends slowly through the tower, it comes in contact with hot water sprays A. (These sprays are shown dotted in Section A-A, as they are actually at a higher level than the section shown.) The sprays, set tangentially to the tower wall, tend to impart a rotary circulatory motion to the pulp. At this point, the pulp is diluted to 5-8 per cent consistency. A cylindrical section B is built into the bottom of the tower, about which the diluted pulp rotates. The pulp discharges through opening G into the inlet of the 4 in. high-density circulation pump through a 10 in. pipe. The pulp is returned to the tower through a 4 in. pipe E. The end of pipe E is flattened at the end to create a nozzle effect. Directly under the pulp discharge, the bottom of the tower is built up to form a dam F, extending upward to a point just below the pipe E. From this point, the bottom of the tower slopes gradually to the lowest level, the discharge opening C. Part of the pump discharge, equivalent to the quantity of pulp being blown into the top of the tower, is taken off through pipe G and is pumped to the neutralizing tank where it is diluted further to about 2 per cent and is neutralized with SO_2 gas to a pH of 4.5-5.0.

The neutralization chest, shown in detail in Section B-B of Fig. 1, is made of wood and is 8 ft. long by 2 ft. wide by 3 ft. deep. A midfeather is built into the center of the chest; and circulation is provided by an impeller.

Bleaching with Peroxides

(continued from page 588)

and allied waste papers is shown in Fig. 7.

Materials of construction

Under normal conditions, undissolved sodium peroxide can be handled in dry iron or steel equipment. Long exposure to humid atmosphere, however, must be avoided.

Successful use of sodium peroxide solutions depends upon the selection of proper structural materials for processing equipment. Stainless steel is the preferred material for handling such solutions. Wood (yellow pine, cypress), glassware, earthenware, special rubber, or enamelware equipment can be used under certain conditions. Solutions can also be handled in iron, steel, concrete or lead if the materials are properly conditioned.

Concentrated hydrogen peroxide solutions can be stored in containers as received or in storage containers fabricated from 99.6 per cent pure aluminum which has been properly cleaned and pickled. Pipelines for conveying the hydrogen peroxide from the containers to the point of use can be made from commercial 3 S aluminum piping. Polyethylene tubing is also excellent for this use. Where pumps are used, the parts which come in contact with hydrogen peroxide must be stainless steel, of the 304, 347, or 316 types. Valves of similar stainless steel can be used for control. Tygon 3400, Tygon 3604A and Tygon 3604B are satisfactory gasket materials.

Acknowledgments . . . .

The editor expresses his thanks to all those whose contribution by way of comments, submitted on paper or orally, have made it possible to complete this focus issue. Special thanks are due to:

Bruce Armstrong, Jackson & Church Co.
W. R. Brandt, Antara Chemicals Div., General Aniline & Film Corp.
John B. Calkin, Foster D. Snell Inc.
V. A. Cosler, E. I. du Pont de Nemours & Co.
S. B. Cupp, E. I. du Pont de Nemours & Co.
J. H. Daughteridge, E. I. du Pont de Nemours & Co.
K. P. Ferguson, E. I. du Pont de Nemours & Co.
E. C. Fetter, E. I. du Pont de Nemours & Co.
D. P. Graham, E. I. du Pont de Nemours & Co.
Burton H. Greenwood, the Burtonite Co.
W. R. Haselton, Rhinelander Paper Co.
Ralph W. Kumler, Foster D. Snell Inc.
H. A. Lips, E. I. du Ponte de Nemours & Co.
F. R. Mayforth, E. I. du Pont de Nemours & Co.
M. J. McLain, E. I. du Pont de Nemours & Co.
A. A. Miller, E. F. Houghton & Co.
S. P. Miller, E. I. du Pont de Nemours & Co.
W. J. Nolan, University of Florida
J. J. Oates, Subox Inc.
E. R. Paul, Swift & Co.
W. Howard Rapson, University of Toronto
J. W. Robinson, E. I. du Pont de Nemours & Co.
G. E. Smedberg, E. I. du Pont de Nemours & Co.
N. J. Stalter, E. I. du Pont de Nemours & Co.
F. J. Walter, E. I. du Pont de Nemours & Co.

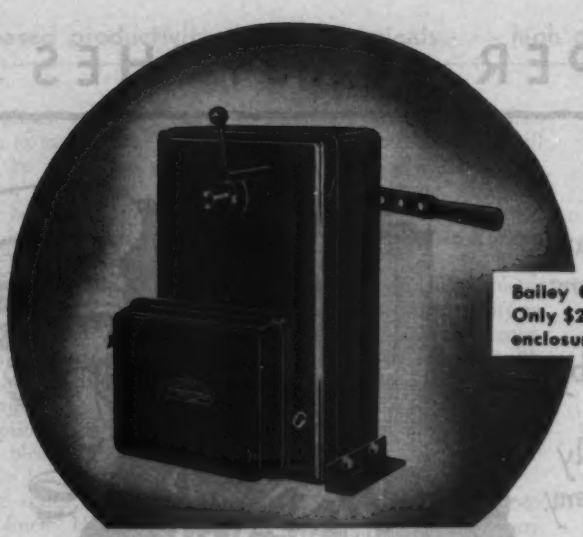
PAPER SKETCHES

Concealed in a large **PAPER BAG**, a German prisoner of the Russians was smuggled out of Brandenburg prison by a sympathetic jail guard and successfully escaped to West Germany.

Beginning in the 1870's pullman cars used **PAPER CORE** wheels for some 25 years. Indeed, 20,000 such wheels, cored with chemically treated, compressed strawboard, were produced by one company in a single year!

Only a few years ago **PAPER BAGS**, not treated chemically for wet strength, easily disintegrated in rain. Currently, a paper company is experimenting with Neoprene to give paper even greater wet strength!

AL REETZ-



Bailey Control Drive, Type AC44P Model 200. Only $210.00 F.O.B. Cleveland, complete with enclosure, positioning relay and hand operator.

Want Better Flow Characteristics from Your Regulating Devices?

This new, small, piston-operated Bailey Control Drive will improve the flow characteristics of butterfly valves, dampers, hydraulic couplings, feeders and similar regulating devices. Adjustment is simple; any desired relation between drive motion and pneumatic signal may be secured.

You can install this compact pneumatic drive power unit in any position on a column, pipe, or flat surface—and connect it to the regulating device with standard Bailey linkage, available from stock.

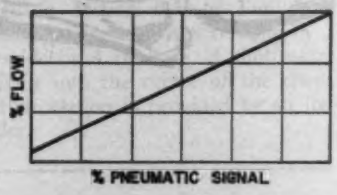
Speed (time required for full travel) is adjustable to suit your requirements. Bailey Control Drives operate on standard SAMA pneumatic signal ranges of 3 - 15 or 3 - 27 psig.

AVAILABLE FROM STOCK in 3 standard sizes

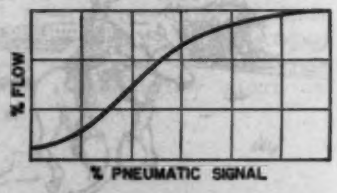
Type	Piston Dia. Inches	Piston Stroke Inches	Torque ft-lb	Max. Travel Degrees	Approx. Dimensions Inches
AC816	8	16	1500	90	13 x 27 x 51
AC68	6	8	400	90	13 x 19 x 34
AC44	4	4	75	75	10 x 11 x 19

P-28

The New Bailey Control Drive gives you THIS—



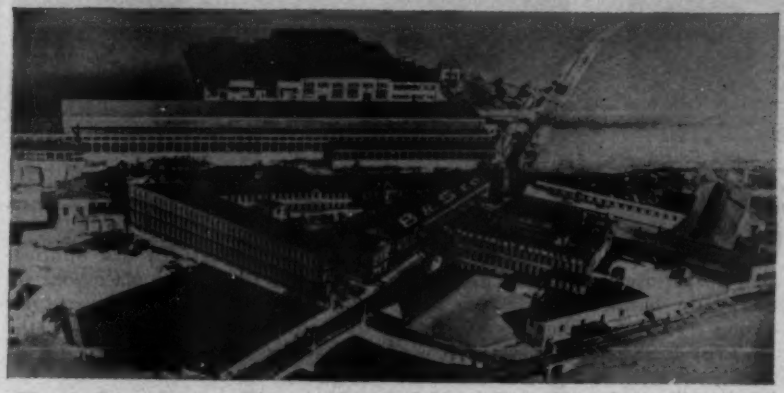
Instead of THIS



BAILEY
METER COMPANY
1058 IVANHOE ROAD
CLEVELAND 10, OHIO
Complete Controls for Process Plants

BAILEY METERS
Controls for
TEMPERATURE
PRESSURE
GAS ANALYSIS
FLOW LEVEL
RATIO

NEWS of the INDUSTRY



Air view of Bagley & Sewall plant at Watertown, N. Y.

C. R. Crawford

W. A. White Jr.

Black-Clawson Co.'s Acquisition of Bagley & Sewall Announced

The Black-Clawson Co. of Hamilton, Ohio, has acquired Bagley & Sewall Co. of Watertown, N. Y. The announcement was made by C. R. Crawford, president of B-C.

The addition of Bagley & Sewall puts the Ohio firm in the forefront among the world's suppliers to the pulp and paper industry. According to a spokesman for Black-Clawson, the Hamilton firm "can now provide practically every conceivable type of equipment used in the production of paper and board. . . ."

Bagley & Sewall—builder of the widest newsprint machine ever constructed in the Western Hemisphere—has 400 employees. It will be operated as a Black-Clawson division. This brings to five the number of B-C divisions:

(1) The Hamilton, Ohio Div., specializing in the manufacture of cylinder paperboard machines; (2) the Shartle Div. of Middletown, specializing in pulp and stock preparation equipment; (3) the Dilts Div., specializing in plastics and paper converting machinery; (4) the Black-Clawson International Div., manufacturing in England the equipment made by the U. S. divisions, and (5) the newly acquired Bagley & Sewall operation.

The combined plants of the enlarged company now have a total manufacturing floor space of more than 800,000 sq. ft. and more than 1500 employees.

Mr. Crawford also announced the appointment of William A. White Jr. as vice president of Black-Clawson and general manager of the Bagley & Sewall Div. He has been associated with the Ohio firm for 15 years in engineering, sales and production. He was formerly operations and plant engineer at Clifton Paper Board Co. of Clifton, N. J.

On occasion of the purchase, Abe Cooper, Bagley & Sewall president, declared: "Black-Clawson is the logical company to maintain Bagley & Sewall's reputation for making small, medium and large high-speed fourdrinier machines of outstanding quality, as well as to continue operating the Watertown plant with their present employee force."

Black-Clawson was established in 1873 as a repair shop to service the machines of paper mills in Ohio's Miami Valley. Bagley & Sewall was founded in 1880 for the manufacture of printing presses, pumps and general machine work. In 1926 Black-Clawson purchased Shartle Bros. Machine Co. of Middletown and in 1940 the Dilts Machine Works.

The acquisition of B & S is another step in the long-planned program of Black-Clawson policy of product diversification to enable it to provide the pulp and paper industry with almost all types of equipment used in the mill.

Morgan and Tinker Appear on NAM Broadcast; See Continued Expansion

Conditions in paper and pulp manufacturing are excellent, and employment is stable, according to two leading representatives of the industry who appeared on a recent broadcast of "It's Your Business."

Participating in the network radio show sponsored by the National Association of Manufacturers were Clyde Morgan, president of Rayonier Inc., and E. W. Tinker, executive secretary of the American Paper & Pulp Association.

Mr. Morgan, who is also vice president of APPA, added that the outlook is for continued expansion. He said that new uses for paper and pulp products, rising per capita consumption in the United States and throughout the free world and the "increasing dependence of the rest of the world on North American cellulose" are factors assuring the continued growth and expansion of the industry.

Present business conditions in the industry are excellent, Mr. Tinker declared during the ABC program. He said that the industry has "operated at well over 90 per cent of its total capacities" to meet market requirements.

The problem of rising costs

Employment is holding up and growing as the industry grows, Mr. Tinker continued, adding that pulp and paper is one of the most stable industries in the country; for this reason he believes that employment will remain stable and continue to expand as living standards remain high.

Discussing the problem of rising costs, Mr. Morgan advised that, "Management in the paper and pulp industry is finding it increasingly difficult to maintain its present plant facilities and to provide the additional capacity required to meet our expanding consumer demands out of earnings, after taxes. Relief should be promptly forthcoming if this industry and other basic industries are to maintain the steady upward prog-

WORK IS CURRENTLY under way in the continuing expansion program of Scott Paper Co.'s West Coast division at Everett, Wash. The air view shows the pulp mill (left background) and the new converting building (foreground). Building to house two new paper machines will be constructed in the area behind the converting unit. Picture at right shows two new high-speed paper machines

Scott Continues West Coast Expansion; May Consolidate with H & W

Highlighting the continuing expansion of Scott Paper Co.'s West Coast division was the recent start-up of No. 2 paper machine at Everett, Wash. No. 1 unit went into production last December.

In conjunction with the additional production that will come from the second high-speed machine, finishing equipment has been installed to manufacture several more Scott products.

Other major areas of expansion include construction progress on the fourth floor of the converting building and work on the new engineering, maintenance and cafeteria building.

Pilings were being driven early in August to support the second unit of the paper mill building. Here, Nos. 3 and 4 paper machines will be installed during the balance of this year and during 1955. According to Charles W. Crist Jr., Scott's West Coast community relations manager, Beloit Iron Works will supply equipment for No. 3, while Newport News Shipbuilding & Drydock Co. will furnish the Yankee dryer.

The addition of new equipment and expansion in the pulp mill in preparation for conversion from calcium to ammonia base cooking is in the final stages. When completed, the pulp capacity will reach a maximum of more than 700 daily tons.

Hollingsworth & Whitney action

Thomas B. McCabe, president of Scott Paper, and James L. Madden, president of Hollingsworth & Whitney Co., stated recently that informal discussions have taken place with respect to consolidating their operations through the establishment of the Hollingsworth & Whitney Div. of Scott.

Under the present program, that division would continue to operate with the present management and organization under the direction of Mr. Madden. A formal plan was to be submitted to the respective boards of directors.

H & W operates a pulp and paper mill at Mobile, Ala., and two pulp mills in Maine, one of which is integrated with papermaking and converting facilities. The firm owns substantial timber tracts in the Mobile area and approximately 1,000,000 acres of forest lands in Maine and eastern Canada.

---

ress demanded by our dynamic economy and by our rising standard of living."

During the course of the discussion, Mr. Morgan pointed out that paper and pulp are substitutes for many things, but rarely does anything substitute for paper. Water alone, he said, is consumed by mankind in greater quantities than paper.

•

Escanaba Expansion Dependent on Availability of Electric Power

Plans for the major improvement of Escanaba (Mich.) Paper Co. are well advanced, according to George H. Pringle, vice president of the Mead Corp. in charge of white paper operations. However, he emphasized that the expansion program is dependent on solution of the firm's power problem.

Mr. Pringle was in Escanaba early in August accompanied by several members of Mead's engineering staff and the chief engineer and assistant engineer of Beloit Iron Works.

"The Escanaba mill is one of the most important mills in the Mead Corp. system," Mr. Pringle declared. "We have a strong demand for white paper such as that produced here, but we cannot proceed until the power problem is solved." (It is reported that the modernization program now under consideration would involve the expense of several million dollars.)

He explained that the action of the city of Gladstone in starting construction of a municipal power plant — releasing a considerable block of power for use by Escanaba Paper — will make it possible for the firm to undertake a minor portion of the construction program.

Upper Michigan Power & Light Co., an Escanaba subsidiary, now provides electricity to the city of Gladstone. Under the terms of a contract negotiated by Gladstone city officials and Mead, the power firm will be relieved of its obligation to the municipality. Escanaba Paper will in turn utilize part of the municipal plant's production.

Major bottleneck still unsolved

The major bottleneck to the paper company's expansion program, however, is the electric problem of the city of Escanaba.

"The greater part of the expansion program cannot be undertaken until the city of Escanaba obtains its power from a new source," Mr. Pringle concluded, "either by contracting for its power from the Upper Peninsula Power Co. or the Alger-Delta Cooperative, or by constructing its own power plant — thus releasing power for use in the expanded operation of the paper mill."

EXPERIMENTAL PAPER machine used in experimentation at Brown Co.

Brown Co. Research: a Story of Battle for Competitive Position

THE PROBLEM OF PROTECTING paychecks and products has become increasingly difficult. The reason: competition for the customer's dollar is keen.

The firm that produces the best product at the lowest cost or a new and improved product that fills a demand will best be able to protect the competitive position of its output and prevent the payroll from dwindling.

It takes a lot of doing, however, to maintain a healthy competitive position . . . and one of the most important factors in the problem is research.

Recently reorganized, the Brown Co. research and development department is a cooperating group of more than 100 men and women—about equally divided between technical graduates, laboratory assistants and supporting clerical and maintenance workers. Assigned a major part of the responsibility for developing both new and improved products and processes and assisting on customer problems, the department's range is extensive.

First modern research group

Brown at Berlin, N. H., established the first modern research organization in the pulp and paper industry, and its current line of products is based on the results of laboratory experimentation through the years. According to a spokesman for the firm, "At Brown, research represents an attitude of mind that welcomes change, since it is the business of research workers to seek constant improvement in products, materials and methods."

Through extensive early research work, the firm was the first to develop chemical processing conditions permitting the use of hardwoods as raw material for market pulp—thereby pioneering the way to economic use of the world's hardwood stands.

Promise of early changes

Major progress has been registered in an ability to produce improved pulps for customers making cellophane, rayon tire cord, photographic papers, electrical tissue, etc. And continuing experimental work holds promise of the early completion of major changes in pulping techniques at Berlin.

Brown research work, however, is by no means ended with the production of high-grade wood fibers. Current activities in the utilization of waste materials from pulping operations include studies of conversion of bark and liquor to useful products. This is highlighted by a process for the manufacture of "furfural" from the wood sugars in waste pulping liquor. The latter was developed in the laboratory and has been carried through successful pilot plant production.

Dozens of novel products

The world's first wet-strength paper was a product of Brown research, and the firm continues to lead in the production of paper toweling for industrial and institutional use.

Experimental research also led to the firm's high position as a maker of paper for coffee bags and flour sacks, for sandpaper, for masking tape. More recently, research has pro-

OPERATION OF a rayon spinning machine used to test pulp samples is checked by Robert Dinsmore

IMPORTANT INFORMATION from a Beckmann spectrophotometer is obtained by Francis Gendron

CHECKING THE operation of a vacuum washer recently installed in the pulp pilot plant is Bert Labonte

DON BORCHERS at the experimental digester control panel in the pulp pilot plant

A FIRE RESISTANCE test on paper recently perfected by Brown for the U. S. Army is made by Mrs. Batrice Lesperance

LABORATORY APPARATUS used in the experimental manufacture of cellophane at the Brown research center

vided the leading paper for making plastic laminates such as the familiar table and counter tops; and a notable technical development in a paper containing both flame and water resistance with wet-strength, which is converted to emergency blankets for disaster use.

Research has also capitalized on the novel fibers and fiber-handling techniques to combine wood pulp with rubber, resins, pitches, etc., to produce Bermico sewer pipe and electrical conduit and the Onco line of products that are used as insoles in shoe products and numerous artificial leather applications.

Experiment is currently developing an entirely new manufacturing process for Onco that has been carried successfully to the pilot plant stage. Again according to a Brown Co. spokesman, "Bermico research is keyed primarily to servicing existing products. We even convert Brown Co. fibers to a finely divided form, Solka Floc, in order to supply the demands of a wide variety of customers who need this type of material.

The research and development department is staffed with versatile and experienced men and equipped with some of the industry's best pilot plants for both pulp and paper development. The laboratory facilities and instruments are currently being modernized and extended.

Ideas are the raw material for research work. Not wild ideas, but those coming from thoughtful reflection.

Wisconsin Mills Threaten Exodus if Mead Reservoir Plan is Rejected

A MASS EXODUS OF the Wisconsin pulp and paper industry might be in the making. Mills in the state have threatened to "move south" if the proposed George Mead Reservoir is not approved by the state Public Service Commission.

The warning was given recently at a meeting of the commission in Wausau by William Thiele of Wisconsin Rapids, a director of Wisconsin Valley Improvement Co. and manager of the power division of Consolidated Water Power & Paper Co.

The Mead Reservoir would be a $6,000,000 project of WVIC to impound water on the Little Eau Pleine River for the benefit of 11 paper and power companies. As Wisconsin's second largest body of water, it would flood 27,500 acres in parts of three counties.

The task before the Public Service Commission is to determine whether the public would gain more through industrial and related advantages than it will lose in a huge natural game habitat.

The WVIC, which serves paper and power interests as regulator of water flow in the Wisconsin River Valley, already owns about two-thirds of the area propsed for flooding.

In answer to sportsmen fearful of

Vigorous Opposition

On August 13 the Wisconsin Conservation Commission placed itself solidly against the proposed George Mead Reservoir.

Sitting at Marinette, the commission by a 5-to-0 vote advised the attorney general's office to oppose vigorously the petition of the Wisconsin Valley Improvement Co.

Commissioner Charles Smith of Wausau abstained. He declared that he was neither voting on, discussing, or intending to take a position on the matter. He explained that his law firm—and not he personally—was representing the WVIC.

the reservoir's affect on the area, Mr. Thiele declared, "We don't have to stop expanding in Wisconsin, but if hunters and fishermen don't want us to expand we'll have to go to Georgia."

Contending that "it's up to the state to show some concern about our welfare," Mr. Thiele asked, "Why should we expand in Wisconsin if Wisconsin doesn't want us." Asked whether Wisconsin has been "pretty good to the WVIC," he declared, "Yes, and the WVIC has been pretty good to Wisconsin, too."

M. W. Kyler of Wausau, vice president and general manager of WVIC, testified that to require that the flowage be cleared of trees and stumps would be "disastrous." Mr. Thiele agreed that the project would be abandoned if the PSC required that.

Project's 11 "advantages"

An earlier witness had been D. C. Everest, WVIC president and chairman of the board of Marathon Corp., which is a part owner of WVIC. He declared that the Mead project would be the 22nd reservoir developed in the valley. He contended that the major part of the land area involved is "largely wasteland and is making no contribution to the economy and wealth" of Wisconsin.

Mr. Everest presented this summary of the project's advantages as seen by WVIC:

1. It will utilize and conserve a renewable natural resource—water.
2. It will increase economic values in the state by making possible greater use of investments because of firming up the river flow.
3. It will further help in utilizing excess high flows that still exist and will help in diminishing flood damage.
4. It will increase the tax base by creating a new $6,000,000 improvement.
5. It will create energy equivalent to at least an annual 36,000 tons of coal.
6. It will create further value because of additional firm power from the river.
7. It will create economic advantages to industry, helping Wisconsin Valley businessmen to expand.
8. It will help the growing cranberry industry by insuring sufficient water levels.
9. It will improve the general water table level.
10. It will help to improve general conservation and recreation opportunities.
11. It represents another step in river development by private enterprise without using any public tax funds or asking any tax benefits.

Concerned about the future

"We are concerned about the future," Mr. Thiele said at one point. "Are we going to expand, or are we going to go south? We do not want to stop expansion in Wisconsin, but we have considered moving to Georgia."

M. S. POWELL RIVER on her maiden trip to her name port

Specially Designed Newsprint Ship Calls at Powell River

One of the few freighters in the world especially designed for carrying newsprint has completed her maiden trip to Powell River, B. C., where she loaded cargo. The new and modern *M. S. Powell River* is owned by Thorvald Hansen of Oslo, Norway, and is operated by Canadian Gulf Line Ltd. of California.

The 353-ft. vessel was launched near Stockholm, Sweden, in November and replaces the *Hoegh Clair* on the southern run. In her construction everything possible was done to facilitate the safe handling and storage of newsprint rolls.

With the engines set aft, the holds of the vessel are so constructed as to accommodate standard roll sizes with the least amount of waste space. Sheer in the lines of the holds has been minimized, also assuring maximum utilization of cubic area. Although the ship is equipped with six sets of gear and three hatch openings, the holds are almost of equal size, enabling gangs to aid each other in each hold and avoiding having a "long hatch."

A false deck on the 'tween deck conceals hatch coamings, and the battens are vertical — instead of horizontal — to assure minimum cargo damage.

On her trial run, *Powell River* performed at 16.3 knots and maintained a cruising speed of 14 knots. Her average speed is now 15 knots when required, according to her skipper, Capt. Olaf Moller, a veteran of 32 years on the high seas.

The new motorship is the second of the name. The original *Powell River*, which first picked up newsprint at Powell River Co. Ltd. in 1947, is now in European service.

Oregon Fibre Uses Sawmill Waste to Conserve Timber

GENERAL VIEW of chip storage silos at Oregon Fibre Products Inc. Capacity of each silo is equal to the requirements of one day's operations. S-A bucket elevator lifts chips to top of silos from belt conveyor leading from chipping and screening

S-A CIRCULAR bin discharger delivers chips from silo to belt conveyor running to digester building. Redler conveyor and horizontal screw deliver chips from temporary storage to digesters at the Pilot Rock, Ore. installation

TRIANGULAR 42-in. flight conveyor takes cooked chips from bins to Bauer Bros. refiners. There are two identical systems at the Oregon Fibre operation. A 9-in. screw conveyor connects the two systems. Plant capacity is a daily 130 tons of wood

BY-PRODUCT WOOD from surrounding sawmills is being used by Oregon Fibre Products Inc. to produce utility fibreboard products at its Pilot Rock, Ore. plant. The present capacity of the new operation is a daily 130 tons of wood.

From chipping and screening operations the raw chips move to a Stephens-Adamson Mfg. Co. bucket elevator, which discharges to either of two large concrete silos. Each silo contains a supply of chips equal to the requirement of one day's operation. Silos are discharged by S-A circular bin dischargers with rotating arch breaker arms.

From storage the chips are moved to the Bauer Bros. Co. pulping system, where an L-type Redler conveyor-elevator moves chips from temporary storage to the digesters. The 19-in. Redler handles 80 cu. ft. of chips per minute, moving them horizontally for 27 ft. and then making a 72-ft. lift. At this point, chips are discharged to a screw conveyor for transport to the digesters. Air-operated slide gates control chip flow.

Cooked chips fall to two specially designed blow tanks, where they are picked up by 42-in. S-A flight conveyors, which feed four Bauer refiners at an hourly rate of 2 tons. A 9-in. screw conveyor connects the two systems.

He told the meeting that trees grow faster in southern states, as much as 4 or 5 ft. in a year. In addition, he said, the price of natural gas in Georgia is only half the price of coal in Wisconsin Rapids.

Mr. Thiele then cited figures comparing the growth of the paper industry in the South and in Wisconsin. He concluded that Wisconsin has not kept pace with the southern states in paper production.

•

Dard Hunter Museum to be Moved to Institute

The Dard Hunter Paper Museum, located for the last 15 years at the Massachusetts Institute of Technology, will be transferred later this year to the Institute of Paper Chemistry at Appleton, Wis. The announcement was made by Westbrook Steele, president of the Institute.

The Hunter collection—said to be the world's finest—illustrates papermaking from its invention in 105 A. D. to the present. In 1939, Dr. Karl Compton, then president of MIT, propsed that the display be brought to Cambridge. In Appleton, it will be housed in the Charles Hayden Memorial Library.

Contained in the collection are specimens of the first papers made from such substances as wood, straw, thistle stalks, corn husks, leaves, potatoes, cabbage stalks, and many other fibers. The watermarks, both ancient and modern, run into the thousands. The decorated papers, most of which are Oriental, number more than 20,000 specimens. Many rare manuscripts, early engravings, and out-of-print books describe the evolution of papermaking equipment and processes. Included in the display of tools and appliances for making paper by hand are numerous items from China, the birthplace of paper.

Hunter to be on staff

Dard Hunter himself will serve as the director of the museum. He has devoted 40 years and has traveled more than 250,000 miles in building the unique collection.

Mr. Hunter has become an international authority on handmade papers, and his assistance to lawyers and librarians in identifying documents was recently the subject of an article in a weekly magazine. He is the author of 23 books on paper. Eight of these have been produced on his own presses and on his own handmade paper; some are printed in type that he designed and made.

News of the Industry . . .

Crown Zellerbach Considers New B. C. Mill

Crown Zellerbach Corp. is considering plans for $17,000,000 in plant expansions to its already extensive properties in British Columbia. Final decision will be made before the end of the year.

The blueprint for the further expansion was announced by J. D. Zellerbach, president of the San Francisco corporation.

C-Z and Canadian Western Lumber Co. (a subsidiary) completed a newsprint mill two years ago at Elk Falls on the east shore of Vancouver Island. Now, the company is considering the erection there of a $15,000,000 kraft pulp mill. With facilities for pulp-drying, the mill would cost much more, Mr. Zellerbach said.

He explained that the green light signal on the Elk Falls plant hinges on major decisions involving the corporation's huge American operations.

The kraft pulp would be used in the manufacture of wrapping papers and containers. One of the plans under consideration calls for the shipment of wet pulp to a mill to be erected on the San Joaquin River in California. Another possibility is that of drying the pulp at the mill for shipment south in bales.

C-Z's second project now under consideration for British Columbia is a $2,000,000 converting plant to be

Stop Foam and Bubble Problems

EFFECTIVELY - ECONOMICALLY

with

AHCO DEFOAMERS

Get this New Brochure NOW!

AHCO DEFOAMERS
FOAM and BUBBLE PREVENTIVES For The Paper Industry
A Guide To Their CHARACTERISTICS and APPLICATIONS
ARNOLD, HOFFMAN
AHCO PRODUCTS

This AHCO DEFOAMERS BROCHURE was prepared especially to help you if your problem is excessive foaming or bubbling during paper production. In it the complete line of AHCO DEFOAMERS is detailed fully . . . one of these AHCO DEFOAMERS could be saving you costly headaches. USE THE COUPON NOW.

AHCO PRODUCTS

ARNOLD, HOFFMAN

PROVIDENCE • RHODE ISLAND

Associated with Imperial Chemical Industries Ltd., London, England

ARNOLD, HOFFMAN & CO., INCORPORATED • EST. 1815 • PROVIDENCE, R. I.

Offices and Sales Service Laboratories:

Providence, R. I., Charlotte, N. C., Paterson, N. J.

Arnold, Hoffman & Co., Inc.
55 Canal Street
Providence 1, Rhode Island

Gentlemen:

Please send me a copy of your new AHCO DEFOAMERS brochure.

Name and Title.....

Firm Name.....

Address.....

City..... State.....

RACK CARS OF PULPWOOD are unloaded into a flume at Union Bag & Paper Corp. in Savannah, Ga., by this Lorain-TL manufactured by the Thew Shovel Co.; the unit consists of a full-revolving Lorain turntable equipped with a pulpwood rake mounted on a gantry that spans the flume; the "TL" drops its 5- by 3-ft. board behind the stacked logs, then with a pull "rakes" the logs into the stream; average unloading time is 4 to 5 min. per car

located on Lulu Island just off the southern tip of Vancouver Island. The firm recently purchased 150 acres on the island. Mr. Zellerbach explained that engineers are considering the feasibility of such a plant; if built, it would combine the operations of two smaller and similar plants now in operation in the Vancouver metropolitan area.

•

Commerce Dept. Foresees Shift to Hardwood for Newsprint Manufacture

The United States is "on the verge of a tremendous shift to the use of hardwoods for paper generally and for newsprint specifically."

In a recent report to the House Judiciary Committee, the Commerce Department foresaw a new source of newsprint. "There are highly encouraging prospects," the report declared, "that native grown hardwoods like poplar, birch, beech and maple will provide a new source of newsprint to meet the increasing appetite of the country's newspaper presses.

"Recent technological developments of fundamental significance have shown the way to efficient and economic pulping of certain abundant hardwood species."

Presenting a bright picture of the current newsprint supply situation, Assistant Secretary Lothair Teetor declared that, "In our judgment, newsprint supply and demand in the United States are currently in balance, and it appears this situation will prevail through 1955. With the increase in world capacity and production, it also appears that world supply will be in reasonable balance with demand in the immediate foreseeable future."

•

Scott Acquires Interest in Westminster Paper

An agreement has been reached under which Scott Paper Co. of Chester, Pa., is to acquire a half-interest in Westminster Paper Co. Ltd. of New Westminster, B. C. The announcement was made jointly by Thomas B. McCabe, president of Scott, and Elmer M. Herb, Westminster president.

Westminster manufactures and sells in Canada an extensive line of sanitary paper products. Its plant — comprising a groundwood pulp mill, three paper machines and converting equipment—is located on the Fraser River.

Mr. Herb stated that the terms of the proposed acquisition are to be presented at an early date to the Westminster stockholders for their approval. He will continue as president and chief executive officer of the Canadian firm.

•

Powell River Subsidiary Plans $1,000,000 Plant

Construction of a corrugated container plant costing nearly $1,000,000 was to be undertaken in late summer by Martin Paper Products Ltd., a subsidiary of Powell River Co. Ltd.

The operation will be located on the North Arm of the Fraser River on Lulu Island adjacent to the sawmill of Westminster Shook Mills Ltd., another Powell River subsidiary. The main building will cover 46,000 sq. ft., and the "heart" of the plant will be an 85-in. Langston corrugator. This and other major items of equipment are on order.

Kraft container board for plant use will be provided by mills now supplying Martin Paper Products plants in Winnipeg, Calgary and Edmonton.

•

Union Bag & Paper Uses Sawmill Wastes

The first carload of bark-free chips produced by F. W. Darby Lumber Co. at Statesboro, Ga., has been converted into paper at the Savannah plant of Union Bag & Paper Corp. According to J. J. Armstrong, manager of the Union Bag & Paper woodlands, the chips were produced entirely from slabs and edgings that had previously been disposed of as waste.

For several months Union Bag's woodlands division and the industrial engineering department of the Savannah plant have been working with Darby Lumber on a waste utilization project. The goal of the project is the conversion of normal sawmill waste into usable chips, the entire output of which will be purchased by Union Bag.

The equipment installed for the processing of chips includes a mechanical log barker, a chipper, chip screen and conveyors for handling both logs and chips. The chips are loaded into boxcars at the Darby plant and unloaded directly into the mill at Savannah.

•

Columbia Offers Package Engineering Course

The paper industry will be represented on the faculty of the Package Engineering Course that is to be offered by the School of Engineering, Columbia University, beginning September 29.

The evening graduate study will be given on Wednesday nights for 15 weeks. Consumer unit packaging, all types of shipping containers, and basic data are to be presented impartially.

Members of the faculty will include: Edward J. Dahill, director of market research for the Fourdrinier Board Institute Inc.; F. V. Deaderick,

Our Cities and Industries are **THIRSTY FOR WATER**

.....so is Agriculture

As more and more people move into private homes, water consumption climbs sharply. Without exception new production techniques in industry result in increased need for water . . . on our farms and ranches, the rapid growth of irrigated acreage means that more water is needed so that our food production can keep pace with population growth. America is truly thirsty!

Layne—the world's largest developers of ground water resources—knows most about these thirsts and how to satisfy them.

The knowledge and experience gained the world over is at your service. Your nearest Layne Associate Company can answer any question that relates to water—or write direct to:

LAYNE & BOWLER, INC.
Memphis 8, Tennessee

Layne Associate Companies Throughout The World

G&K

Leather Belting

wraps the pulleys

for more production-power

It Grips — Leather's resilient, frictional surface grips the pulley face, causing belt and pulley to move as one power unit.

It Pulls — Like a python, leather belting is strong, flexible, with controlled stretch — *wraps* the pulleys and gives peak performance on *any* drive.

It's 3-Dimensional — Leather's millions of fibres are interlaced to form the tough *three-dimensional* structure so necessary for PULLINGRIP — *developed to the highest degree in G&K Leather Belting.*

Call your G&K Industrial Supplies Distributor for flat, round, link and V-belting, belt lacing, dressings, cements, packings and specialty leathers. Writes for free Belting Catalog 101.

8-2

GRATON AND KNIGHT

Memo: **Paper Mill Superintendents**

Here's a drive you can depend on — if the belting is G&K leather. Every drive in the mill — from beaters to take-off reels — must keep pulling at top efficiency with minimum stretch. That's why superintendents specify G&K RESEARCH® brand for top tonnage output.

GRATON & KNIGHT Company

WORCESTER, MASS., U.S.A.

$1,200,000 STEAM AND POWER plant recently completed by the Haverhill (Mass.) Boxboard Div. of Robert Gair Co. Inc. The equivalent of an eight-story building, it is 83 ft. long, 60 ft. wide, and 90 ft. high above the basement floor. The structure houses the boiler feedwater pumps and the chemical treating equipment for the boiler feedwater. The water softener and deaerator, 44 ft. in height, is capable of handling 200,000 lb. of water per hour in the deaerator and 75,000 lb. in the water softener. The new boiler delivers 100,000 lb. of steam per hour of superheat steam at 610 psi and 650°F. Steam from this unit is delivered to a 2500 kw topper turbine. The boiler is coal-fired by two pulverizer units, each of which has an hourly capacity of 6700 lb. of coal

vice president and director of Bemis Bros. Bag Co.; Walter C. George, director of research for Gaylord Container Corp.; Glenn Mather, secretary of the Fibre Drum Manufacturers Association and technical adviser to Continental Can Co. Inc.; Frank Pocta, secretary of the Paper Shipping Sack Manufacturers Association Inc., and Lawrence T. Ross, manager of the sales development laboratories of Union Bag & Paper Corp. at Hudson Falls, N. Y.

•

Canadian Industry Sets Production Records

During the first six months of 1954 Canada's pulp and paper industry established several production records. Prospects are that the year will be one of the best in history.

June newsprint shipments in North America were the greatest for any month on record. Canada's mills worked at more than 99 per cent capacity.

Production and export of all grades of pulp were up considerably from the previous year. Paperboard, wrapping paper and similar grades were also well above 1953 production levels. Stocks of newsprint on hand and in

transit to U. S. newspapers at the end of June amounted to a 42 day's supply, as against 44 days at the same time last year.

Newsprint production up

Canadian newsprint production in June was up 5.9 per cent at 490,726 tons, and the total for the year to June 30 was 2,937,706, showing an increase of 4.1 per cent over last year. Canadian shipments outside the U. S. and Canada were up 42.9 per cent for the first six months. Total shipments from Canadian mills during the month were 523,966 tons, up 7.7 per cent from 1953.

Canada's June pulp production was 790,933 tons, down from May's 805,579 tons, but output for the first six months was 4,679,297 tons—up 6.4 per cent from the same period in 1953. Wood pulp exports for the year to date total 1,050,475 tons, as contrasted to the 930,781 tons in the first half of last year.

Paperboard production during the year to June 30 amounted to 366,532 tons, as against 364,728 tons in the first six months of 1953. Boxboard production was higher, while container grades dropped slightly. Corrugated stayed at about the same level.

Production of wrapping and similar grades of paper during the first half of 1954 was 120,955 tons, an increase from the 114,187 tons the year before. Exports of 4,287 tons showed a sharp increase over last year, when only 2,866 tons were shipped.

•

South Accounts for 37% of National Production

Figures recently announced by the Atlanta, Ga. office of the U. S. Department of Commerce show that in 1953 the Deep South accounted for 37 per cent of the national production of paper and paper products.

The data, compiled by the Bureau of the Census, revealed that the production of paper products last year in the southeastern area aggregated 9,770,241 tons, whereas in the nation the total was 26,458,781 tons.

A breakdown of southern production shows that the greater part—5,528,597 tons—was paperboard. In this category, 4,305,078 tons were container board; 774,382 bending board; 166,854 non-bending board, and 282,283 special paperboard stock and similar products.

Of the total paper production,

Rated performance of every Nash Vacuum Pump is assured by this precise laboratory test

Rated capacities of Nash Vacuum Pumps are not theoretical. Every Nash Pump is tested individually. Air capacity is determined by delivery thru accurately machined and calibrated orifices. Related vacuum is measured by precise mercury column, and horse power is recorded electro-dynamically. Records of these tests are retained by us, and certified copies are available to Nash Pump owners.

That is one of the reasons why Nash Vacuum Pumps are installed in over a thousand leading Paper Mills. An engineer from Nash will be glad to survey your mill, and make recommendations, entirely without obligation to you.

NASH ENGINEERING COMPANY

440 WILSON ROAD, SO. NORWALK, CONN.

Nekoosa-Edwards Open House Attracts 10,000 Visitors

A COMPLETE MILL TOUR was a major attraction of the recent open house staged by Nekoosa-Edwards Paper Co. at Port Edwards, Wis. More than 10,000 visitors were counted during the week-long event. At the left, Gov. Walter Kohler (l) views a scale model of No. 9 paper machine with John Alexander, Nepco president and general manager. In the center, George W. Mead (in wheelchair) inspects the L. M. Alexander memorial plaque with Adam Remley, Nepco's former sales vice president. At the right, men prominent in the industry view the Nepco forestry display; they are (l to r) Roy Sund, executive vice president of Marathon Corp., Milan Boex, also a Marathon vice president, and Earl W. Tinker, executive secretary and treasurer of the American Paper & Pulp Association

News of the Industry . . .

248,898 tons were newsprint; 191,060 uncoated book paper; 116,227 fine paper; 2,069,109 coarse paper; 201,469 special industrial paper, and 66,145 sanitary tissue.

•

Expansion Notes

Consolidated Water Power & Paper Co. will construct a $1,300,000 woodroom at its Wisconsin Rapids (Wis.) Div. Preliminary plans call for a 205- by 136-ft. plant that will incorporate the latest developments in wood preparation processes. The building will replace a structure built in 1920 and remodeled in 1930. The woodroom will provide for an increase of more than 50 per cent in capacity. Completion is scheduled for August 1955.

Fabricon Products Inc. of Detroit has been purchased by Eagle-Picher Co. for $9,780,738. Fabricon has two plants at River Rouge, Mich., and one each at Bridgeport, Conn., Philadelphia, Pittsburgh and Los Angeles. The firm makes foundation panels and other fiber products for the automotive industry, waxed paper and cellophane wrappers for the food industry, and plastic products.

The Container Division of **International Paper Co.** has announced plans for the construction of a sheet plant designed to provide shipping containers for industry in the northern and western New York State area. The plant will be located in Geneva, N. Y., where a 16-acre tract has been acquired.

International Paper Co. has acquired the outstanding stock of American Paper Exports Inc. (APEX), which stock was formerly held by several paper companies. APEX has for many years operated as an export outlet for International. It will now be integrated with the sales program of the firm. APEX has representatives located throughout South and Central America, the West Indies, the Philippines and the Far East.

Alton Box Board Co. plans to acquire all the outstanding stock of Rosenthal Paper Co., one of St. Louis' oldest paper jobbing and box manufacturing firms. The firm produces all types of folding cartons under the name of Acme Folding Box Co. and in addition jobs all types of retail folding boxes and many paper products.

Piedmont Paper Products Inc. of Buena Vista, Va., has been purchased by Bonded Fibres Inc., a Virginia corporation. The new corporation takes over Piedmont's mill for the manufacture of a leather substitute.

Dominion Paper Box Co. Ltd. plans a new Toronto plant to house its expanding operations. Production in the 180,000-sq. ft. building is expected in December.

John Dickinson & Co. Ltd. of Hamilton, Ont., has announced plans for a large addition to its new plant and the sale of its original factory.

U.S. Paper and Paperboard Production

	June 1954 (tons)	May 1954 (tons)	June 1953 (tons)	Total 1953* (1,000 tons)	Total 1948
Paper and Board, total	2,269,912	2,238,313	2,269,410	26,459	21,897
Paper, total	967,359	962,832	941,409	11,394	11,119
Newsprint	97,510	96,151	89,306	1,069	876
Groundwood paper (uncoated)	66,214	64,630	62,969	771	772
Printing and converting (coated)	101,513	102,143	94,859	1,183	809
Book paper (uncoated)	132,163	131,360	140,387	1,623	1,570
Fine paper (writing, cover and text, bristols, thin paper and other)	113,292	110,232	108,556	1,290	1,141
Coarse paper (unbleached kraft, glassine, greaseproof, vegetable parchment and other)	235,178	233,596	279,086	3,398	3,027
Special industrial paper (including absorbent)	43,509	44,321	47,423	553	415
Sanitary tissue stock	108,319	110,200	99,152	1,277	983
Tissue paper (except sanitary and thin paper)	19,661	19,604	19,721	231	205
Paperboard, total	1,033,042	1,016,933	1,063,111	12,220	9,366
Container board, total	554,898	560,676	579,727	6,613	5,079
Liners	368,127	387,215	390,591	4,411	3,347
Corrugating material	160,904	147,715	157,117	1,906	1,376
Container chipboard	25,867	25,746	32,019	296	319
Bending board	316,789	302,842	302,932	3,566	2,153
Nonbending board	73,979	71,228	84,835	898	597
Special paperboard stock	78,147	77,300	82,733	1,071	1,568
Cardboard	9,229	6,887	12,884	72	67
Wet machine board, total	11,247	10,958	14,092	155	142
Construction paper and board, total	258,264	245,590	250,798	2,688	2,591
Construction paper	127,024	115,560	125,909	1,312	1,321
Hardboard and insulating board	131,240	130,030	124,889	1,376	1,270

(*) Preliminary report. Source: U. S. Department of Commerce.

Necrology . . .

R. T. Anderson

Richard T. Anderson, vice president of Paterson Parchment Paper Co. of Bristol, Pa., died August 9 at his home in Lawrenceville, N. J. He was 75.

A native of Passaic, Mr. Anderson was graduated from Stevens Institute of Technology. He joined Paterson Parchment in 1919 as plant engineer and later was elected secretary. In 1923 he was named assistant general manager. He became general manager in 1932 and vice president in 1945.

M. J. Trees

Merle J. Trees, 71, chairman of the board of Chicago Bridge & Iron Co., died in Chicago August 6.

Mr. Trees joined Chicago Bridge as an estimator and contractor in 1910 and in 1945 was named chairman of the board.

W. H. Graebner

W. H. Graebner, 49, pulp and paper mill manager for Marathon Corp., died July 27 in Neenah, Wis., following a long illness. Mr. Graebner joined the firm as a quality control chemist in 1927.

In 1929 he was made research chemist at the Rothschild plant and in 1931 was named manager of the technical department in manufacturing. He was promoted to the position of manager of the Menasha waxed paper plant in 1950, in June of that year was named manager of the central production staff and in August was made coordinator of plant expansion. Mr. Graebner was appointed chief mill manager in 1952.

A graduate of Lawrence College and the University of Wisconsin, Mr. Graebner was a member of Tappi and for two years during World War II was a member of the War Production Board.

Carlo Vicario

Carlo Vicario, former partner in the firm of Clark & Vicario Co. of Bronxville, N. Y., died in San Francisco July 27 as the result of an accident. He was 52.

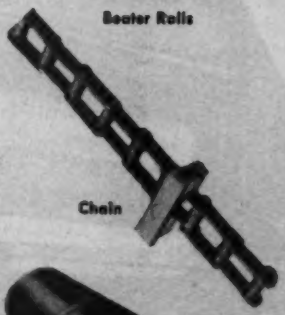
A graduate of the Massachusetts Institute of Technology, Mr. Vicario formed the Clark & Vicario sales engineering firm in 1945 in partnership with Carl Clark. Prior to that time he had been associated for many years in the pulp and paper division of Nash Engineering Co.

The Steel that Builds a "CALLOUS" to Resist Wear!

Outstanding for wear parts in Beaters, Jordans, Slitters, Chippers, Conveyors, etc.

TISCO®
MANGANESE STEEL
The HARDER it works ...the HARDER it gets

Beater Rolls



Chain

Jordan Plugs Linings, Sleeves

- Cold work-hardens to needs of the job
- Outlasts other alloys 2 to 5 times under heavy impact and abrasion

TISCO Manganese Steel actually grows stronger with increasing wear-resistance under the heavy pounding, shock and abrasion that destroy most other alloys. It has never been surpassed for wear-resistance in punishing service.

Specify TISCO for new equipment or replacement parts. Get full benefit of Taylor-Wharton's long experience producing and applying manganese steel, which assures the right analysis for the job—sound castings that are properly heat-treated and ground to accurate dimensions—careful inspection by the most modern techniques to provide flaw-free castings.

Rebuild and repair worn parts with TIMANG Weld Rod, Rounds, Squares, Flats and Plates.

Write for descriptive bulletins.

Founded TW 1742

TAYLOR-WHARTON
IRON AND STEEL CO.

HIGH BRIDGE 5, N. J.
Cincinnati, O. Birmingham, Ala. Easton, Pa.

Perkins Rolls—

performing equally well in this wide calender as in many smaller calenders—Perkins engineered and built.

B. F. PERKINS & SON, Inc.

HOLYOKE, MASS., U.S.A.

LARGEST MANUFACTURERS OF CALENDER ROLLS IN THE WORLD

ALLIED NEWS

Ross Buys Midwest-Fulton

J. O. Ross Engineering Corp. has completed the outright purchase of the Midwest-Fulton Co. of Dayton, Ohio, manufacturer of drainage systems used in the paper and textile fields.

While J. O. Ross will continue to design and manufacture its air systems for all industries, a new firm known as Ross Midwest Fulton Corp. of Dayton has been organized to handle all M-F business. The Ohio plant will continue operations, and no personnel changes are contemplated.

According to a company announcement, M-F drainage systems are used on more than 75 per cent of all paper machines now in operation. The Ohio firm will be represented in Canada by Ross Engineering of Canada Ltd., with offices in Montreal, Toronto, Port Arthur and Vancouver.

PAPER MILL MEN participating in the semi-annual sales meeting of Albany Felt Co. are (l to r) Ken Osborn, superintendent of Ohio Boxboard Co., Rittman, Ohio; Harold Bragdon, assistant purchasing agent of S. D. Warren Co., Cumberland Mills, Maine; Jim Smith, assistant sales manager of Albany Felt, and Leonard Parkinson, superintendent of Rhinelander Paper Co., Rhinelander, Wis.

New Firm to Manufacture Plastic Pipe Fittings

Tube Turns Plastics Inc. is a new firm recently organized at Louisville, Ky., for the manufacture of industrial plastic pipe fittings and custom molded products.

The $1,500,000 organization was established jointly by Jackson & Church Co. and the Tube Turns Div. of National Cylinder Gas. Co. and will serve the paper, oil, chemical, food, and allied industries.

Tube Turns Plastics will use an exclusive process of injection molding of unplasticized polyvinyl chloride. Officials of the new firm declared that the new process and equipment will permit the use of "difficult-to-mold" PVC and similar plastic materials in the fabrication of products that cannot otherwise be manufactured economically on a commercial scale.

Booklet Depicts Lindsay's 50th Anniversary

The Lindsay Wire Weaving Co. of Cleveland has marked its 50th anniversary with the publication of a special booklet, "Quality Fourdrinier Wires Since 1904."

Depicting chronologically the various processes in the manufacture of fourdrinier wire cloth, the brochure highlights some of the more important conditions affecting its use and life.

Highlight of the publication is the presentation of two flow sheets. One shows the fabrication of bronze and brass wires, while the second shows the actual manufacture of the wire—from stock to packing.

In addition to a detailed account of the weaving process, the Lindsay booklet discusses such items as quality control, engineering, research and finishing.

•

Allied News Notes

The Development and Research Division of International Nickel Co. Inc. has established four new sections: Constructional Alloy Steels, with H. V. Beasley in charge; Electroplating, with Charles H. Sample in charge; IncoNickel Alloys Development, with T. E. Kihlgren in charge, and Stainless Steel and Heat-Resistant Alloys, with Dr. V. N. Krivobok in charge.

Yarnall-Waring Co. has moved its Midwestern sales office to new and larger quarters in the Machinery Hall Building, 549 West Washington St., Chicago 6. The firm also announced the addition of three representatives to the Chicago sales staff: F. M. Carson, H. R. Peterson and G. J. Wagner.

Gulf Sulphur Corp. has started construction of a $2,500,000 Frasch process plant to produce sulfur in the State of Vera Cruz, Mexico. Completion is expected by May of 1955.

General Aniline & Film Corp. has boosted to 50 tons daily the output of its proposed chlorine-caustic plant at Linden, N. J. The original plans called for a 26-ton capacity for the $5,000,000 operation. Design and construction is to be by the Blaw-Knox Co. Completion is expected by the fall of 1955.

General American Transportation Corp. of Chicago has announced the acquistion of the Fuller Co. of Catasauqua, Pa., designer and manufacturer of pneumatic conveying systems for dry bulk materials handling. The transfer includes Fuller's wholly-owned subsidiaries, Hershey Machine & Foundry Co. of Manheim, Pa., and Separation Process Co. of Catasauqua.

The peroxygen products sales development group of E. I. du Pont De Nemours & Co.'s Electrochemicals Department has been moved from Niagara Falls, N. Y., to Wilmington, Del. The move was made to provide closer coordination with other departmental units.

Lockport Felt Co. of Newfane, N. Y., and Orr Felt & Blanket Co. of Piqua, Ohio, have announced the signing of contracts with Dowingtown Mfg. Co. for a total of four new felt dryers and stretchers. All are similar, having been developed jointly by the three firms. Both Lockport dryers will have faces of 320 in., while one of the Orr units will be 250 in. and the other 320 in.

Graton & Knight Co. of Worcester, Mass., has announced the opening of a new Detroit branch office at 16146 Wyoming St. The branch was formerly at 1627 West Fort St.

Clark Equipment Co. has reported a realignment of executive responsibilities in the Industrial Truck Div. Robert H. Davies, formerly in charge of truck production and engineering, will exercise over-all direction of the division. W. E. Schirmer, vice president previously in charge of industrial truck sales, will be assigned special projects.

Glidden Co. plans to build a titanium dioxide and sulfuric acid plant on a 100-acre site at Baltimore.

Clark Equipment Co. has appointed George Industrial Equipment Co. Inc. as

Allied News . . .

the sole distributor of Clark fork-lift trucks and other materials handling equipment in the Greater New York area.

•

Allied Personalities

Lewis R. Parker has been elected president of Albany Felt Co. to succeed Frederick McDonald, who is now chairman of the board. A graduate of Yale University, Mr. Parker joined Albany in 1928 and became industrial sales manager in 1934. In 1941 he was named assistant to the president, vice president in 1944, and executive vice president in 1946.

Donald C. Oskin has been appointed manager of sales and **James R. Harris** assistant manager of sales for the Westvaco Mineral Products Div. of Food Machinery & Chemical Corp. In another FM&CC move, **Arthur F. Smith** has been named manager of sales and **Preston F. Tinsley** assistant manager of sales for the Westvaco Chlor-Alkali Div.

Arthur G. Heinel, formerly in charge of the Atlanta office of Atlas Powder Co., has been appointed technical representative in charge of the firm's new sub-office in Richmond, Va. **Adrian J. Stewart**, a technical representative in the chemicals department, will succeed Mr. Heinel at Atlanta.

FOR THE FIRST time in the industry, Norton Co. is completing a "guinea pig" pulpstone in order to probe its innermost secrets; electrical devices are being placed within the wheel to measure the stresses and temperatures developed in pulpstones under the most trying conditions; the stone will be tested in the Millinocket, Maine mill of Great Northern Paper Co.; it measures 62 by 54 in. and in it is buried equipment to measure such things as power, speed, wood pressures, shower conditions, etc.

G. H. Weight, formerly on the Chicago sales staff, has been promoted to the post of southwest district sales manager for the Tubular Products Div. of the Babcock & Wilcox Co. He will represent the firm in Texas, Oklahoma, Arkansas, Mississippi, Louisiana and southern Kansas.

The Fielden Instrument Division of Robertshaw-Fulton Controls Co. has announced the appointments of **Donald Daily** and **William H. Johnson** to the sales staff.

W. H. Johnson

D. L. Shirley

Link-Belt Co. has announced the appointment of **Donald L. Shirley** as district sales manager for the Seattle, Wash. area. . . .The following appointments have been announced at the Alliance, Ohio research and development center of the Babcock & Wilcox Co.: **P. R. Grossman** to chief research engineer; **A. F. Boehm** to manager of facilities; **G. A. Watts** to superintendent of the products section; **J. F. Wachunas** to superintendent of the technical services section, and **W. O. Stone Jr.** to purchasing agent.

Dr. Wayne E. Kuhn has been named general manager of the newly created

We Design, Build and Repair

TILE Structures

The smallest repair job receives careful attention . . .

The largest construction job handled with highest efficiency

All work — design, engineering, erection, maintenance — is performed by industry-famous teams of Stebbins specialists. All work is guaranteed. Stebbins service available on quick notice anywhere in North America.

Write for FREE copy of Bulletin A-153

SEMCO

STEBBINS

Engineering and Manufacturing Company, Watertown, N. Y.

STEBBINS ENGINEERING CORP. 1904 TOWER BLDG. SEATTLE, WASH.

CANADIAN STEBBINS ENGR. & MFG. CO. LTD. CASTLE BLDG. MONTREAL, CANADA

SINCE 1884

Specialists in Design, Installation and Servicing of Linings and Tile Tanks

LARGEST LOOM IN the Western Hemisphere was recently installed at the Albany, N. Y. plant of Albany Felt Co. Part of an over-all expansion program, the 650-in. loom was manufactured by Crompton & Knowles and will provide a considerably increased range for the production of both joined and endless woven felts

Research and Technical Department of the Texas Co. He was formerly manager of the Technical and Research Division.

Ralph W. Kumler has joined the staff of Foster D. Snell Inc. as a pulp and paper consultant. He was previously technical director of the Paper Chemicals Department of American Cyanamid Co.

H. B. Wilson

Jack Moss

The Pusey & Jones Corp. has reported two moves in the sales staff: **H. B. (Whitey) Wilson** is now district sales engineer for the South, with headquarters in Savannah, Ga.; **Jack Moss**, a veteran of 13 years with P&J, has been transferred to Kalamazoo, Mich. . . . **William A. McMahan** was recently made western district sales manager for Carver Pump Co. of Muscatine, Iowa. He will be located at Rolling Hills, Cal., and will cover Arizona, California, Oregon, Washington, Nevada, Utah, Idaho, Wyoming and Montana.

Frank C. Arnold has joined Downingtown Mfg. Co. as a sales engineer for finishing machinery. He has had 28 years' experience in the paper industry, having been associated with Parker Young Co., Oxford Paper Co., and Moore & White Co.

John P. Termini, formerly with National Starch Products Inc., has joined the Permutit Co. as a research engineer in the Special Applications Department.

Ralph K. Behr, formerly located at the Chicago district office, has become manager of the Boston district office of the Babcock & Wilcox Co.'s Boiler Div. He succeeds **H. K. Dean**, who has retired after 31 years' service.

Clifford S. Reppe, formerly manager of the Akron, Ohio sales office, has been appointed assistant district manager for the Paper Makers Chemical Department of Hercules Powder Co. in Holyoke, Mass.

Frank W. Quiggin has been appointed assistant to the sales vice president at the New York, N. Y. sales headquarters of the Blower-Stoker Division of the Read Standard Corp.

Roscoe Long has been promoted to the position of senior chemical engineer with A. E. Staley Mfg. Co. in Decatur, Ill.

Dr. Frederick M. Meigs has been named general manager of foreign operations for General Aniline & Film Corp. He was formerly assistant general manager.

William Morrison has been named a sales representative for the William Powell Co. Mr. Morrison, formerly with the Newark, N. J. branch of the Crane Co., will serve industry in the New York area.

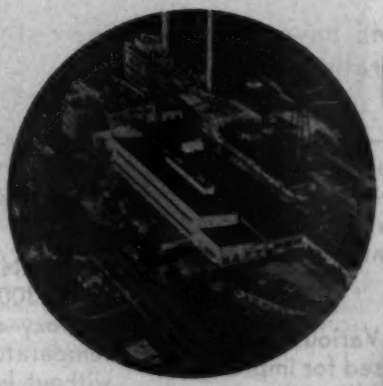
Vernon J. Liberty has been appointed assistant manager of the Industrial Rolls Division of Rodney Hunt Machine Co. He has been a sales engineer for the division four years.

Donald A. Comes has been elected vice president of Farrel-Birmingham Co. Inc. He will continue as general sales manager.

J. C. Barthel has been named technical director of American Cyanamid Co.'s Paper Chemicals Department. He replaces Ralph W. Kumler.

a better product and more of it

with the



CHEMI-PULPER®

Continuous Digester

The Filer City Plant of the AMERICAN BOX BOARD COMPANY

"Worthless" forests of aspen woods near Filer City, Michigan, are now a valuable source of raw material for American Box Board's Filer City plant which will produce 120,000 tons of .009 paperboard corrugating medium per year now that their $10,000,000 expansion and modernization program is completed.

Aspen, previously considered useless for conventional paper because of its extremely short fibers, is being converted into excellent pulp by CHEMI-PULPER Continuous Digesters at the Filer City plant. These digesters operate on an around-the-clock basis and supply pulp for the papermaking machines.

CHEMI-PULPER Continuous Digesters are operating in many prominent mills producing pulps for products from boards to bleach grades.

Write for Bulletin C3.

Manufactured and Sold in Canada by
THE ALEXANDER FLECK LIMITED, OTTAWA, CANADA.

PANDIA

PANDIA INC.

122 EAST 42nd STREET • NEW YORK 17, N. Y.

PENFORD GUMS

(STARCH HYDROXY ETHYL ETHERS)

(U. S. Patent Numbers 2,516,632; 2,516,633; 2,516,634)

PENFORD GUMS are the products of an exclusive patented process which makes it possible to attach hydroxy ethyl groups to starch molecules by strong ether linkages resulting in entirely new products — hydroxy ethyl ether starches. These perfected synthesized starch derivatives have the desirable characteristics of both water soluble film forming polymers and starch.

The unusual and highly advantageous properties contained in PENFORD GUMS are providing a solution of many quality and production problems.

PENFORD GUMS have established new standards of perfection in these operations:

1. CALENDER USAGE — PENFORD GUM 280 definitely increases Mullen on all board furnishes. PENFORD GUMS 240, 250, and 260 are widely used for finishing board later printed with most exacting high gloss inks.

2. TUB OR SIZE PRESS — Various grades of PENFORD GUM are used for improving strength, finish, controlling densometer, and for preventing excessive penetration of other finishing materials like lacquer, wax, ink, coatings, etc.

3. PIGMENTED SIZE PRESS COATING— PENFORD GUM 250 is used as the sole adhesive for producing coated offset paper and for coating board which may be wet finished on the calenders.

4. ON- AND OFF- MACHINE COATINGS — The high fluidity PENFORD GUMS, either as-is or resinated, are excellent coating adhesives assuring level coatings of high pick.

5. WET END ADDITION — PENFORD GUM 300 is a brand new member of the hydroxy ethyl ether class which is low temperature swelling and disperses without lumping in the fiber furnish but yet is completely gelatinized on the fastest machine. It requires no cooking and may be added dry or in liquid slurry.

6. ADHESIVES — A number of the PENFORD GUMS are used in adhesive formulations such as regular or waterproof solid fiber, corrugated board, bags, multiwall sacks, tubes, and drums. A special formulation has been developed for high speed layflat flexible adhesive.

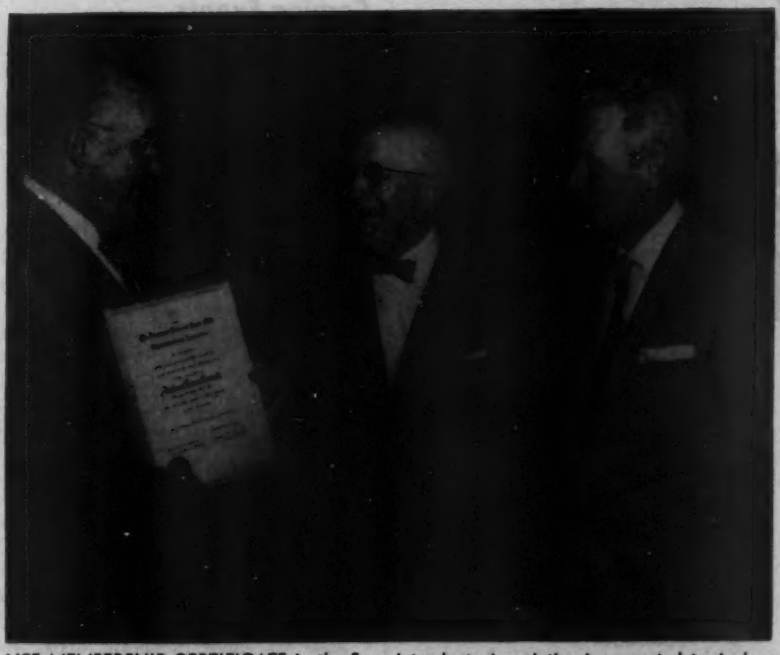
PENICK & FORD, LTD.

Incorporated

420 Lexington Ave., New York 17, New York

806 Rona Allen Bldg., Atlanta, Ga. — Cedar Rapids, Iowa

ASSOCIATION NEWS



LIFE MEMBERSHIP CERTIFICATE in the Superintendents Association is presented to Andrew T. Barnett (center) during a recent meeting of the Connecticut Valley Division at Holyoke, Mass.; Mr. Barnett, now retired, received much of his early experience on the staffs of Connecticut Valley mills; his most recent position was as superintendent at Continental-Diamond Fibre Co. in Bridgeport, Pa.; C. H. (Bert) Kent, formerly of Hercules Powder Co., makes the presentation as Edward McQuillan, division chairman, looks on

PRESENTATION OF GAVEL to Larrence Graham (second from right), vice president of the eastern section of the Salesmen's Association of the Paper Industry, was made at the Yale Club in New York, N. Y., recently by Fred H. Pinkerton, vice president and sales manager of Reinhold-Gould Inc.; Mr. Graham is manager of the New York sales office of International Paper Co.; looking on are Charles Lander (l), vice president and general manager of Reinhold-Gould, and William C. Kennedy (r), district sales manager of Southern Advance Bag & Paper Co.

Kindig Heads Michigan Superintendents

Harrison Kindig, Mac Sim Bar Paper Co. of Ostego, Mich., has been elected chairman of the Michigan Division of the Superintendents Association for the 1954-55 season.

Other officers named with Mr. Kindig were: Claude J. Bos of St. Regis Paper Co., Kalamazoo, first vice chairman; Marshall H. Rutz of Kalamazoo Vegetable Parchment Co., Parchment, second vice chairman; Martin Galbraith of Sutherland Paper Co., Kalamazoo, secretary-treasurer. Leon H. Mimms of Kalamazoo Paper Co. was the retiring chairman.

Speakers for the meeting were O. W. Callighan of the Edgar Division of Minerals and Chemicals Corp. of America, who is chairman of the Industrial Affiliates Committee of the Superintendents Association; and Raymond L. Barton of Michigan Paper Co. at Plainwell.

Maryland-Virginia Paper Group Organized

Announcement has been made of the formation of a new pulp and paper group in the states of Maryland and Virginia. An organizational meeting was to be held September 17 at the Hotel Jefferson in Richmond.

Tentative name of the new group is the Chesapeake and Alleghany Paper Club. According to John H. Symes, temporary chairman, the purpose of the organization is to eventually affiliate with Tappi. Mr. Symes is chief chemist for National Container Corp. of Virginia at Big Island.

Officers in addition to Mr. Symes are: Robert Hobbs of the National Bureau of Standards, vice chairman; Julian Weaver of Froehling & Robertson, treasurer, and John Priest of Halifax Paper Co., membership.

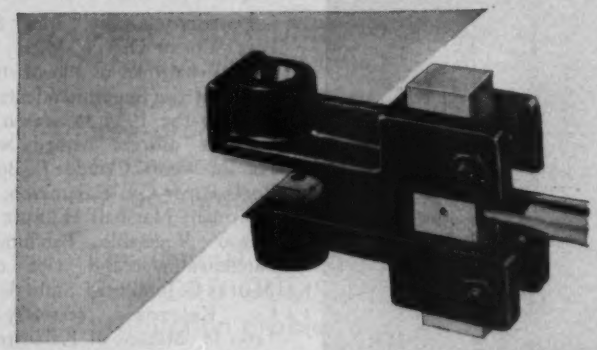
Chicago Tappi Officers

Elected officers of the Chicago Section of Tappi for the 1954-55 year have been announced as follows:

Chairman—J. D. Johnson of Container Corp. of America, Chicago; vice chairman—A. C. Dreshfield of the Chicago Testing Laboratory, Chicago;

ASKANIA
EDGE CONTROL

Nothing touches the web but a breath of air



ANILINE PRESS

LAMINATOR

REGULATOR

SLITTER-REWINDER

The Askania Paper Guide Control has proven its worth in hundreds of different applications. It is extremely fast, accurate and dependable. It guides moving webs with a breath of air.

This paper guide holds edge positions to ±1/32", with a simple modulating control system. For many paper product manufacturers this accurate control can mean important savings in production costs, less material waste, more efficient use of personnel. It's powerful, too... the Askania control can position even the heaviest mill rolls with ease.

Adjustments, if ever necessary, can be made by your own men. No maintenance required.

If you have a paper guiding problem, it will pay you to discuss it with Askania engineers—or write for bulletin No. A-161.

ASKANIA REGULATOR COMPANY

278 E. Ontario Street, Chicago, Illinois

Subsidiary of General Precision Equipment Corp.

Association News . . .

secretary—J. R. Lyons of Atlas Boxmakers Inc., Chicago, and treasurer—R. D. Carter of Keyes Fibre Co., Hammond, Ind.

•

Coming Events

TAPPI

Sept. 21-24—Research Conference on the Fundamentals of the Paper Machine (joint session with CPPA's Technical Section), the Institute of Paper Chemistry, Appleton, Wis.

Oct. 6-8—Eighth Alkaline Pulping Conference, Dinkler-Tutwiler Hotel, Birmingham, Ala.

Oct. 6-8—Fourth Testing Conference, Dayton-Biltmore Hotel, Dayton, Ohio

Oct. 18-21—Ninth Engineering Conference, Benjamin Franklin Hotel, Philadelphia

Nov. 8-9—Fibrous Agricultural Residues Conference, National Regional Research Laboratory, Peoria, Ill.

Nov. 17-19—Corrugated Containers Conference, DeSoto Hotel, Savannah, Ga.

American Pulp & Paper Mill Superintendents Association

Sept. 23-25—Northeastern Division, Poland Spring House, Poland Spring, Maine

Oct. 1-2—Pennsylvania-New Jersey-Delaware Division, Bedford Springs Hotel, Bedford Springs, Pa.

Oct. 9—Connecticut Valley Division, Berkshire Inn, Great Barrington, Mass.

Oct. 13-15—Southeastern and Southern divisions (joint fall meeting), George Vanderbilt Hotel, Asheville, N. C.

Dec. 3-4—Pacific Coast Division, New Washington Hotel, Seattle

Other meetings

Sept. 21-24—CPPA Technical Section, Research Conference on the Fundamentals of the Paper Machine (joint session with Tappi), the Institute of Paper Chemistry, Appleton, Wis.

Sept. 23-24—National Flexible Packaging Association (fall meeting), Moraine on the Lake, Highland Park, Ill.

Sept. 27-29—American Management Association, Personnel Conference, Hotel Astor, New York, N. Y.

Oct. 3-7—Electrochemical Society Inc., Statler Hotel, Boston

Oct. 11-13—American Management Association, Manufacturing Conference, Hotel Plaza, New York, N. Y.

Oct. 12-14—Society of American Foresters Annual Convention, Milwaukee (tentative)

Oct. 18-22—42nd National Safety Congress and Exposition, Chicago

Oct. 20-22—American Management Association, Office Management Conference, Hotel Astor, New York, N. Y.

Nov. 3-5—American Management Association, Finance Conference, Roosevelt Hotel, New York, N. Y.

Nov. 10-12—American Management Association, Insurance Conference, Palmer House, Chicago

NAMES *in the* NEWS

Green Bay Announces Staff Changes

Promotions of three staff members and the filling of a newly created position have been announced by Green Bay Paper & Pulp Co. at Green Bay, Wis. James R. Wright has been appointed to the new position of production manager. Robert J. Wilkes has been promoted to general superintendent in charge of manufacturing operations. J. E. Barnhart has been promoted to chief engineer. William R. Nelson has been promoted to technical director.

Mr. Wright was formerly associated with West Virginia Pulp & Paper Co. and with Riegal Carolina Corp. Mr. Wilkes previously had been employed by Mosinee Paper Mills Co., Nekoosa-Edwards Paper Co., and National Container Corp. Mr. Barnhart was previously with Morris Paper Mills. Mr. Nelson was formerly a research assistant in the division of pulp and paper at the U. S. Forest Products Laboratory in Madison.

St. Regis Names Sloan

Hugh W. Sloan, vice president of St. Regis Paper Co. (Canada) Ltd., has been appointed to direct the company's operations. Mr. Sloan succeeds Thomas H. Cosford who was managing director of the Canadian company until his retirement in July.

Mr. Cosford joined Bates Valve Bag Corp. — later acquired by St. Regis — in 1910. He was elected a director of the parent company in 1942 and a vice president in 1951.

Mr. Sloan had been assisting Mr. Cosford since last year and was Pacific Coast manager for the Multiwall Bag Division before coming to the New York office in 1951.

Robert Tugaw of Detroit has joined the staff of Western Containers Inc. of Lockport, N. Y., a subsidiary of the Ohio Boxboard Co. He was formerly plant manager for National Container Corp. of Michigan.

E. H. Niederauer (upper left)

G. H. Sheets (upper right)

J. R. Taggert (lower left)

Mead Appoints Niederauer

Edward H. Niederauer's appointment as manager of the Kingsport, Tenn. division of the Mead Corp. has been announced by George H. Pringle, vice president for white paper operations. George H. Sheets will be assistant division manager, and John R. Taggert has been promoted to general paper mill superintendent.

Until recently Mr. Pringle had been serving as general manager of the division in addition to his duties as head of Mead's white paper operations.

A 25-year man with the firm, Mr. Niederauer joined Mead as a member of the staff at the Chillicothe, Ohio laboratory. He later served in technical positions at Kingsport and at Sylva, N. C., and was made assistant technical director at Kingsport in 1932. After service at the Dill & Collins division in Philadelphia, he returned to Kingsport as technical assistant to the production manager.

In 1947 Mr. Niederauer was made general superintendent of the Escanaba Paper Co. in Escanaba, Mich., another Mead division, and in 1951 was elected an Escanaba vice president. In 1953 he came back to Kingsport as production manager, the post he held until his present promotion.

Mr. Sheets, a graduate of the Institute of Paper Chemistry, joined the Mead staff in 1941 as a member of the development department. He was at one time assistant to the executive vice president and in 1952 was made assistant to the Chillicothe division manager. He was named assistant to the general manager at Kingsport in 1953.

Mr. Taggert was formerly assistant production manager at Kingsport. He has been with the firm since 1933, when he joined the Chillicothe inspection department. Following service with the sales service department, he was put in charge of Escanaba's inspection, sales service and order department. He was transferred to Kingsport last year.

Ernest Carlton Wood Jr., former army captain, has been named general manager of Carolina Paper Mills Inc. in Rockingham, N.C. At one time associated with Firestone Tire & Rubber Co., Mr. Wood has recently been assistant to the chief of general supplies at the U. S. Army Quartermaster purchasing office in New York, N. Y.

E. C. Wood Jr.

Walter Metts

Walter Metts has been appointed senior vice president of Personal Products Corp. Formerly vice president in charge of manufacturing, he recently directed the construction of Personal Products' research center in Milltown, N. J., and of the newly completed Sunnyvale, Cal. plant.

Marathon Promotes Den Dooven

Edward E. Den Dooven, manager of the Northern Paper Mills Div., has been appointed pulp and paper mills production manager for the entire Marathon Corp. His successor at Northern is John Bard, who was previously staff assistant to Roy J.

News in the News . . .

Sund, executive vice president in charge of manufacturing.

Succeeding Mr. Bard as staff assistant is Arnold E. Isaacson. John E. Goode, assistant to Mr. Den Dooven at Northern, has been named general superintendent of the Green Bay plant.

In another Marathon appointment, Harry W. Gochnauer has been made the firm's chief plant engineer. For the past 33 years he has held a similar post with Northern, now a Marathon division. He attended Lawrence College at Appleton and the University of Pittsburgh.

Four Personnel Changes Announced by Fraser

Fraser Companies Ltd. of Edmundston, N. B., has announced the following personnel changes.

Donald A. Forbes has assumed the duties of chief engineer for the firm and its subsidiaries. J. S. Overbagh has been appointed assistant chief engineer. He is succeeded as assistant manager of the Madawaska, Maine mill of Fraser Paper Ltd. by R. J. Martin. And E. R. Hunting has been appointed divisional chemist, the post formerly held by Mr. Martin.

D. A. Forbes

J. S. Overbagh

R. J. Martin

E. R. Hunting

A native of Scotland, Mr. Forbes joined Fraser in 1945 as assistant chief engineer. In 1950 he became chief engineer of the western division of Fraser Companies Ltd. and of Fraser Paper Ltd. Prior to joining Fraser he had worked with Consolidated Paper Corp., Ltd., Price Bros. & Co. Ltd., and Minnesota & Ontario Paper Co.

Mr. Overbagh became associated with Fraser Paper in 1940. In 1947 he became plant engineer, and in 1951 he was appointed assistant to the mill manager. The following year he was named assistant mill manager.

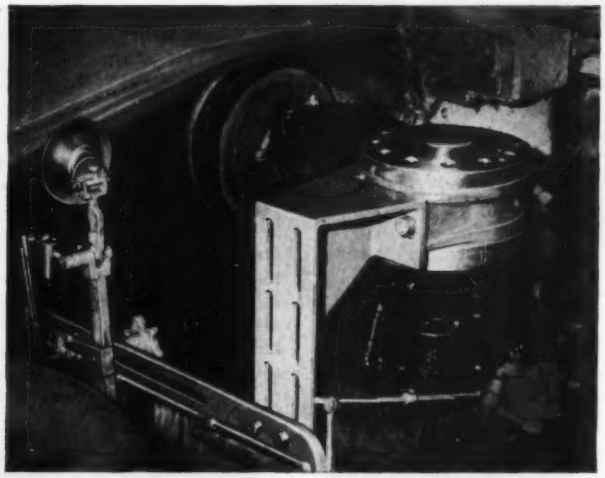
A member of the staff since 1939, Mr. Martin became divisional chemist at Edmundston in 1950 and was named to a similar post at Madawaska in 1951.

Mr. Hunting joined Fraser Paper as a junior chemist in 1947. In 1953 he was appointed assistant divisional chemist.

Thode Resigns at Maine

Dr. Edward F. Thode, a member of the University of Maine faculty since 1947, has resigned as associate professor of chemical engineering. He has accepted a position in the research department of Minnesota Mining & Mfg. Co.

Dr. Thode is well known for his research activities into the surface and electric properties of wood pulp.



teaching a wire to toe the line...

It's model 706, new Gilbert & Nash Hydra Guide with rotary palm* for wire, wet felt, and dryer felt service. Shown in actual use—now in its second year—at Sorg Paper Company, Middletown, Ohio, #6 machine, Smith mill.

High speed machines—even variable speed machines—are no handicap to model 706. Its guide roll moves only in a *horizontal* plane to avoid undue wire stretch . . . continuously corrects at a plus or minus 1/64 inch . . . eliminates over-correction or hunting.

Hydraulically operated by water pressure—where filtered water pressure is 40 to 60 lbs.—or by oil pressure with a pump of one gallon per minute capacity. Send for free Hydra Guide folder or, at no obligation, write for a Gilbert & Nash representative to call at your mill.

GILBERT and NASH APPLETON, WISCONSIN

*Manufactured and sold exclusively by The Appleton Machine Company

He is an active member of Tappi, serving on its chemical methods committee.

He was active in the inception of the U. of M. Pulp and Paper Foundation and has served as a member of its curriculum committee. For a number of years he was also a member of the scholarship committee.

Deerfield Glassine Changes

Deerfield Glassine Co. of Monroe Bridge, Mass., has announced that W. A. Wylde, vice president, has been named executive vice president and director. He has been with the firm since 1934.

In other changes, William K. Prutzman, since 1944 assistant treasurer, has been made treasurer. Mr. Prutzman is also treasurer of Canadian Glassine Co. Ltd., a subsidiary of the Monroe Bridge firm.

Charles W. Cassell, formerly chief engineer for Everett Pulp & Paper Co. of Everett, Wash., has joined Deerfield Glassine as assistant to the president. He has been in the industry 25 years and is a graduate of the Institute of Paper Chemistry.

Harold L. Field becomes Deerfield's chief chemist. He was formerly research director of the Mechanicville, N. Y. mill of West Virginia Pulp & Paper Co.

Two recent appointments have been reported by Crown Zellerbach Canada Ltd. **R. R. Edwards** has been named vice president for manufacturing, and **R. R. Ferguson** has been made resident manager at the Ocean Falls Div.

Carl S. Volk has recently been made vice president and treasurer of Canadian International Paper Co. to succeed J. P. Monge, who has been named treasurer of International Paper Co. of New York, N. Y. Mr. Volk was formerly treasurer of International.

Colin Gardner, executive vice president of Gardner Board & Carton Co., is celebrating his 45th anniversary with the firm. His son, **Colin Gardner III,** vice president of operations, is observing his 20th.

Wausau Paper Mills Co. has announced the appointment of two men to its sales staff. **Folke Becker Jr.** has been assigned the territory immediately west of the Mississippi River; **Joe H. Rye** will handle the West Coast region. Mr. Becker was previously in sales promotion work

Folke Becker Jr.

Joe H. Rye

following completion of a training program at the mill.

George Olmsted Jr., president of S. D. Warren Co., Boston, has been named general chairman for the Direct Mail Advertising Association's 37th annual convention.

Robert C. Henry has been appointed project engineer of Marathon Corp.'s plant at Menominee, Mich. He was formerly on the plant engineering staff at Menasha, Wis. Mr. Henry succeeds Martti A. Lundstrom, who has been transferred to the Ashland plant as project engineer.

WIRE DRAWING • QUALITY CONTROL

LOOM CONSTRUCTION AND MAINTENANCE

ENGINEERING • WEAVING

RESEARCH

INSPECTION • FINISHING

CAREFUL SHIPMENT

Each step is deliberately careful with a view to making Fourdrinier wire cloth better, in order that better paper may become likewise a reality.

THE LINDSAY WIRE WEAVING COMPANY
Cleveland 10, Ohio

LINDSAY WIRES Since 1904

FOR PAPER MANUFACTURING

How Industry Is Using The Economical DIETERT-DETROIT Moisture Teller

Company Identification and Material	% Moisture Content	Drying Temp. Used	Weight of Sample	Time Required
A MOLDING SAND	4.8%	300° F	50 grams	2 min.
B WOOD PULP	10%	234° F	25 grams	7 min.
C CLAY	2%	330° F	50 grams	15 min.
D COTTON YARN	5.5%	230° F	10 grams	15 min.
E CELLULOSE ACETATE STAPLE YARN	6%	230° F	50 grams	10 min.
F FLAKE SOAP	12%	240° F	50 grams	12 min.
G CORK	6%	170° F	25 grams	15 min.
H RUBBER CHEMICALS	7.5%	140° F	10 grams	45 min.
I PAPER	5%	212° F	50 grams	5 min.
J CORN STARCH	10%	275° F	1 gram	10 min.

THE DIETERT-DETROIT MOISTURE TELLERS OFFER INDUSTRY AN ECONOMICAL, EASY-TO-OPERATE, DIRECT MOISTURE TEST METHOD. NO CHEMICALS ARE EMPLOYED, NO COMPLICATED ELECTRONIC CIRCUITS TO WORRY ABOUT, NO INVOLVED MATHEMATICAL COMPUTATIONS ARE NECESSARY.

THE VERSATILE MOISTURE TELLER CAN BE LOCATED RIGHT OUT IN THE PLANT OR IN THE LABORATORY.

DIETERT-DETROIT MOISTURE TELLER MODEL NO. 276

HARRY W. Dietert COMPANY

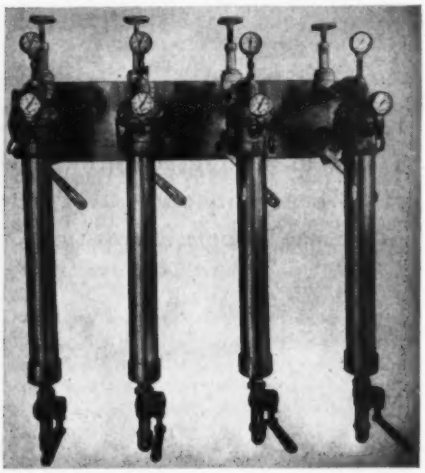
CONTROL EQUIPMENT · SAND · MOLD · MOISTURE · CARBON · SULFUR

9330 ROSELAWN AVE. • DETROIT 4, MICHIGAN

Write for LITERATURE

How Paper Mills overcome IRON WATER PROBLEMS

• RONNINGEN •



• FOURPLEX FILTER •

Paper mills using deep well water encounter plugged shower nozzles, sprays and valves — also stained wires or containers due to excess iron bacteria, rust, and iron deposit (Ferric Oxide).
RONNINGEN fine mesh wire cloth filters solve this problem effectively and economically. They are non short-circuiting and have sealed ends that keep out foreign matter.

Write for Bulletin #25406-K TODAY

STRAIN AGAIN WITH RONNINGEN

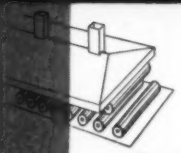
"Particles large or small, we *FILTER* them all"

RONNINGEN - PETTER COMPANY

Vicksburg, Michigan Phone: 5161

NEWCOMB-DETROIT

PIONEERS IN INDUSTRIAL VENTILATION



HEAT & AIR SYSTEMS

that cut cost and increase production in

PAPER MILLS

ESTABLISHED 1912
• DETROIT DIVISION
• GRAND RAPIDS DIVISION
• NEWCOMB INDUSTRIES, LTD., WINDSOR DIVISION

For Bulletins and Quotations Write

NEWCOMB-DETROIT
5763 Russell St.
Detroit 11, Mich.

SAFETY NEWS

PRINCIPLES OF SAFETY are discussed by Fred T. Morrish, O-M safety supervisor, at the Fort Frances meeting. Seated are (left foreground), John Midgley, electrical department foreman, and (right) Ernest Charlebois, assistant groundwood supervisor

Safety Record of O-M Electrical Department Cited at Ontario Meeting

An unblemished 16½-year safety record was honored recently at the 17th meeting of the Northwestern Branch of the Ontario Pulp & Paper Makers Safety Association. The record belongs to the electrical department of Ontario-Minnesota Pulp & Paper Co. Ltd's. Fort Frances mill.

According to J. F. MacKellar, O-M's vice president and general manager, the impressive record was the cause for congratulations from the more than 50 safety officials from 10 northwestern Ontario pulp and paper firms who attended the Fort Frances gathering.

Chairman of the meeting was E. R. Marston of Marathon Corp., who is chairman of the association.

Feature of the opening sessions was an accident hazard inspection of the Fort Frances groundwood specialty paper and newsprint mill, in addition to the annual "Idea Clinic."

Two Fort Frances supervisors addressed the evening meeting. Subject for E. A. Charlebois, assitant groundwood supervisor, was the role of the supervisor and the foreman in accident prevention. These individuals, he said, should be thoroughly trained in accident prevention techniques. This makes them better equipped to instruct their men, Mr. Charlebois explained.

J. F. MacKELLAR, O-M vice president and general manager, joined in the discussion

It is important, the speaker continued, to start the new man out with the impression that the company is interested in his safety and welfare; such a procedure may be costly in both time and money, but it will forestall accidents.

Reporting on the outstanding record achieved by the O-M electrical department was John Midgley, department foreman. Employees must think of their jobs and safety as one and indivisible, he explained. Mental attitude is important. Guidance, instruction and decision are present all down the line, so that the safety steps necessary are considered part and parcel of the job.

Safety procedures are followed at all times before a crew may go to work, Mr. Midgley added. Methods of providing his own clearance are discussed with the employee for each job.

An important element in the program followed by the electrical department, he explained, is a thorough induction program for each new employee. This includes a talk with the superintendent and the foreman and an introductory tour of the many departments in the mill. This is followed by a visit to the plant nurse and first aid station, where safe working habits are explained.

The new man is then introduced to the department's personnel, and for the first few days he works with a helper qualified to give him detailed information regarding all aspects of the job.

"Safety and job are indivisible," Mr. Midgley concluded. "Knowing this, management, superintendent, foreman, journeyman and helpers form an unbeatable safety team."

•

Fraser Mill Receives Three Safety Awards

For its outstanding safety record of operation throughout the past year without a single lost-time accident, the Newcastle, N. B. kraft pulp mill of Fraser Companies Ltd. recently received three awards.

R. B. Murchie, mill superintendent,

Announcing the NEW **HANCHETT**

MODEL SK-24

SLITTER KNIFE GRINDER
for
Top or Bottom SLITTERS
WET GRIND

- *finest finishes*
- *extreme accuracy*
- *rigid construction*
- *capacity 3" to 24" diameter*
- *semi or fully automatic*
- *positive and accurate fixturing*

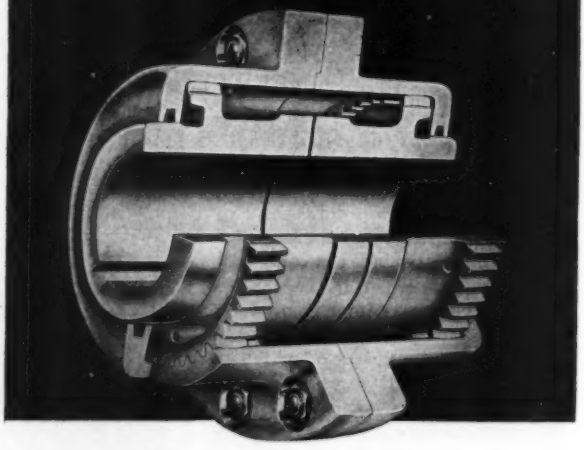
HANCHETT MANUFACTURING COMPANY
World's Largest Manufacturer of Knife Grinding and Saw Sharpening Machinery
MAIN OFFICE — Big Rapids, Michigan WEST COAST — Portland 1, Oregon

The *Sandy Hill* CREED

To keep informed on the problems of paper and pulp making;
and
To engineer, develop and produce constantly better equipment to meet those problems...

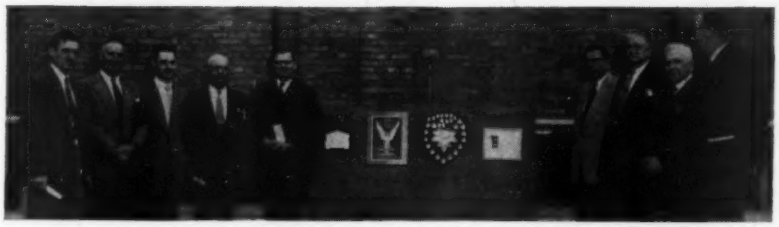
The SANDY HILL
Iron & Brass Works
Hudson Falls, N.Y.

POOLE



A COPY OF CATALOG GIVING FULL DESCRIPTION AND ENGINEERING DATA SENT UPON REQUEST.

FLEXIBLE COUPLINGS
POOLE FOUNDRY & MACHINE COMPANY WOODBERRY, BALTIMORE, MD.



FLANKING THE SAFETY awards recently presented the Newcastle mill of Fraser Companies Ltd. are (l to r): M. Kenny, president of Local 689 of the International Brotherhood of Pulp, Sulphite and Paper Mill Workers; D. A. Adams, chairman of the safety committee; D. E. Honer, chairman of the Mutual Interest Board; P. E. Roy, mayor of Newcastle; the Hon. Hugh John Flemming, premier of New Brunswick; A. Crabtree, president and general manager of Fraser; the Hon. A. E. Skaling, provincial labor minister; Lt. Col. W. A. MacDougall, chairman of the New Brunswick Workmen's Compensation Board, and R. B. Murchie, mill superintendent

accepted the awards on behalf of the plant personnel.

Aubrey Crabtree, president of Fraser, made the presentation of the plaque given each year by Board Chairman Harold Crabtree to the company mill having the best safety record.

Lt. Col. W. A. MacDougal, chairman of the Workmen's Compensation Board at St. John, presented two plaques in behalf of the National Safety Council, Chicago.

The first award was made to the Newcastle mill as the winner in its group in the pulp and paper industry safety contest sponsored annually by the NSC for operations in the United States and Canada. The other plaque, an award of merit, was given in recognition of the mill's noteworthy performance during 1953.

127 Firms Maintain Perfect Scores in Six-month NSC Report

A RATE REDUCTION of 13 per cent from the same period last year has been recorded during the first six months of 1954 by the 509 participants in the Paper Industry Safety Contest sponsored by the National Safety Council.

From the eligible mills in Division I the board of judges will select the mill with the most outstanding record.

Perfect scores recorded for the first six months were as follows:

Division I—Pulp and Paper Mills

Group A

Sonoco Products Co., Hartsville, S. C.
Kimberly-Clark Corp., Kimberly, Wis.
Alton Box Board Co., Alton, Ill.
Quebec North Shore Paper Co. Ltd., Baie Comeau, Que.

Group B

Price Bros. & Co. Ltd., Riverbend, Que.
P. H. Glatfelter Co., Spring Grove, Pa.
Crossett Paper Mills, Crossett, Ark.
Sorg Paper Co., Middletown, Ohio
St. Croix Paper Co., Woodland, Maine
International Paper Co., Tonawanda, N. Y.

Group C

Gaspesia Sulphite Co. Ltd., Chandler, Que.
Escanaba Paper Co., Escanaba, Mich.
Abitibi Power & Paper Co. Ltd., Pine Falls, Man.
International Paper Co., Southern Kraft Div., Mobile, Ala.
Crystal Tissue Co., Middletown, Ohio
National Vulcanized Fibre Co., Yorklyn, Del.

Group D

Fraser Companies Ltd., Newcastle, N. B.
Price Bros. & Co. Ltd., Jonquiere, Que.
National Container Corp., Big Island, Va.
Certain-Teed Products Corp., E. St. Louis, Ill.
Certain-Teed Products Corp., Savannah, Ga.
Bartgis Bros. Co., Ilchester, Md.
Allied Chemical & Dye Corp., Barrett Div., Elizabeth, N. J.
Riegel Paper Corp., Warren Mill, Riegelsville, N. J.
Coos Bay Pulp Corp., Empire, Ore.
U. S. Gypsum Co., Oakmont, Pa.
Container Corp. of America, Los Angeles
Central Fibre Products Co., Tama, Iowa
New York & Pennsylvania Co. Inc., Willsboro, N. Y.
Johns-Manville Products Corp., Pittsburg, Cal.
The Weston Paper & Mfg. Co., Terre Haute, Ind.
Container Corp. of America, Chattanooga, Tenn.

Group E

Lloyd A. Fry Roofing Co., Moorehead City, N. C.
Lloyd A. Fry Roofing Co., Portland, Ore.
Certain-Teed Products Corp., Marseilles, Ill.
Lloyd A. Fry Roofing Co., Compton, Cal.
U. S. Gypsum Co., N. Kansas City, Mo.

Safety News . . .

Lloyd A. Fry Roofing Co., Jacksonville, Fla.
Lloyd A. Fry Roofing Co., Irving, Texas
Lloyd A. Fry Roofing Co., N. Kansas City, Mo.
Lloyd A. Fry Roofing Co., Brookville, Ind.
Riegel Paper Corp., Hughesville Mill, Riegelsville, N. J.
The Mead Corp., Nashville, Tenn.
The Flintkote Co., Mt. Carmel, Ill.
The Mead Corp., Bristol, Va.
Lloyd A. Fry Roofing Co., Memphis, Tenn.
Kimberly-Clark Corp. of Canada Ltd., Kapuskasing, Ont.
Central Fibre Products Co. Inc., Denver, Col.
National Gypsum Co., Newburgh, N. Y.
Robertson Paper Box Co. Inc., Montville, Conn.
Riegel Paper Corp., Riegelsville Mill, Riegelsville, N. J.
Volney Felt Mills Inc., Fulton, N. Y.
Container Corp. of America, Wilmington, Del.
The Logan-Long Co., Franklin, Ohio
Munroe Falls Paper Co., Munroe Falls, Ohio
Johns-Manville Corp., Tilton, N. H.
Dominion Tar Chemical, Toronto, Ont.
American Writing Paper Corp., Mt. Tom Div., Holyoke, Mass.
Rogers Corp., Manchester, Conn.
Spaulding Fibre Co., Inc., Hayes Plant
Dominion Tar Chemical, Vancouver, B. C.

Division II—Paper Converting

Paper Bags

St. Regis Paper Co., San Leandro, Cal.
St. Regis Paper Co., Los Angeles
St. Regis Paper Co., Dryden, Ont.
Thilmany Pulp & Paper Co., Kaukauna, Wis.
St. Regis Paper Co., Vancouver, B. C.
Pillsbury Mills Inc., Wellsburg, W. Va.

Boxes and Cartons

Group A

Michigan Carton Co., Battle Creek, Mich.
General Foods Corp., Battle Creek, Mich.
Container Corp. of America, Chattanooga, Tenn.
Container Corp. of America, Medford, Mass.
Bartgis Bros. Co., Ilchester, Md.
Gaylord Container Corp., St. Louis
Container Corp. of America, Los Angeles
Container Corp. of America, Emeryville, Cal.
International Paper Co., Container Div., Chicago
Container Corp. of America, Rock Island, Ill.
Fort Wayne Corrugated Paper Co., Chicago Div., Chicago
Container Corp. of America, F & C Div., Manayunk Div., Philadelphia
International Paper Co., Los Angeles

Group B

Hankins Container Co., Union, N. J.
Gaylord Container Corp., Dallas

now
even better

SKF Triple-Seal
"SAF" PILLOW BLOCKS

BETTER Because SKF's Type "C" Spherical Roller Bearings . . . .

Increase capacity 25% to 50%
increase service life 2 to 3½ times

The big news in bearings—news from SKF—is the Type "C" Spherical Roller Bearing—as a replacement for ordinary sphericals, size for size, lasts *2 to 3½ times longer, increases capacity up to 50%.*

This improved design is now available in SKF's famous Triple-Seal "SAF" Pillow Blocks.

You get this longer life and increased capacity *in addition* to—

- Effective sealing from dirt.
- Lubricant retention.
- Adapter mounting for tight fits on standard shafting.
- "Free" or "Held" design.
- Easy installation and inspection.
- Self-alignment.
- NO INCREASE IN COST!

YOUR SKF DISTRIBUTOR will give you complete details about the "C" bearing and a copy of SKF Bulletin No. 365 which contains technical data, sizes available, increased life and capacity you can expect for each size.

SKF INDUSTRIES, INC., PHILADELPHIA 32, PA.
—manufacturers of SKF *and* HESS-BRIGHT *bearings.*

7521

SKF®
BEARINGS AND
PILLOW BLOCKS

Container Corp. of America, Cleveland
Gaylord Container Corp., Atlanta, Ga.
International Paper Co., Springhill, La.
Gaylord Container Corp., Carton Plant
Fort Wayne Corrugated Paper Co., Rochester, N. Y.
Container Corp. of America, Valley Forge, Pa.
Container Corp. of America, Seattle, Wash.
Container Corp. of America, Knoxville, Tenn.
Hoerner Boxes of Keokuk Inc., Keokuk, Iowa
Hoerner Boxes of Sand Springs Inc., Sand Springs, Okla.
Container Corp. of America, Baltimore, Md.
National Container Corp. of Indiana, Aurora, Ind.
Gaylord Container Corp., Beaver Falls, Pa.
Hankins Container Co., Miamisburg, Ohio
Container Corp. of America, Greensboro, N. C.
Container Corp. of America, Portland, Ore.
Container Corp. of America, Lake Shore Plant, Chicago
Bay West Paper Co., Green Bay, Wis.
Gaylord Container Corp., San Antonio, Texas
Mott Carton Paper Co., St. Louis
Container Corp. of America, Muskogee, Okla.
Hankins Container Co., Little Rock, Ark.
National Container Corp., Philadelphia

Roofing Paper

Ruberoid Co., Gloucester, N. J.
Ruberoid Co., Erie, Pa.
Lloyd A. Fry Roofing Co., Stroud, Okla.
Johns-Manville Products Corp., Los Angeles
Lloyd A. Fry Roofing Co., York, Pa.
Lloyd A. Fry Roofing Co., Robertson, Mo.
Lloyd A. Fry Roofing Co., San Leandro, Cal.
Lloyd A. Fry Roofing Co., Detroit

Insulation and Building Board

Johns-Manville Corp., Jarratt, Va.
The Flintkote Co., Hilo, Hawaii
Armstrong Cork Co., Pensacola, Fla.
Celotex Corp., Metuchen, N. J.
Abitibi Power & Paper Co. Ltd., Sturgeon Falls, Ont.

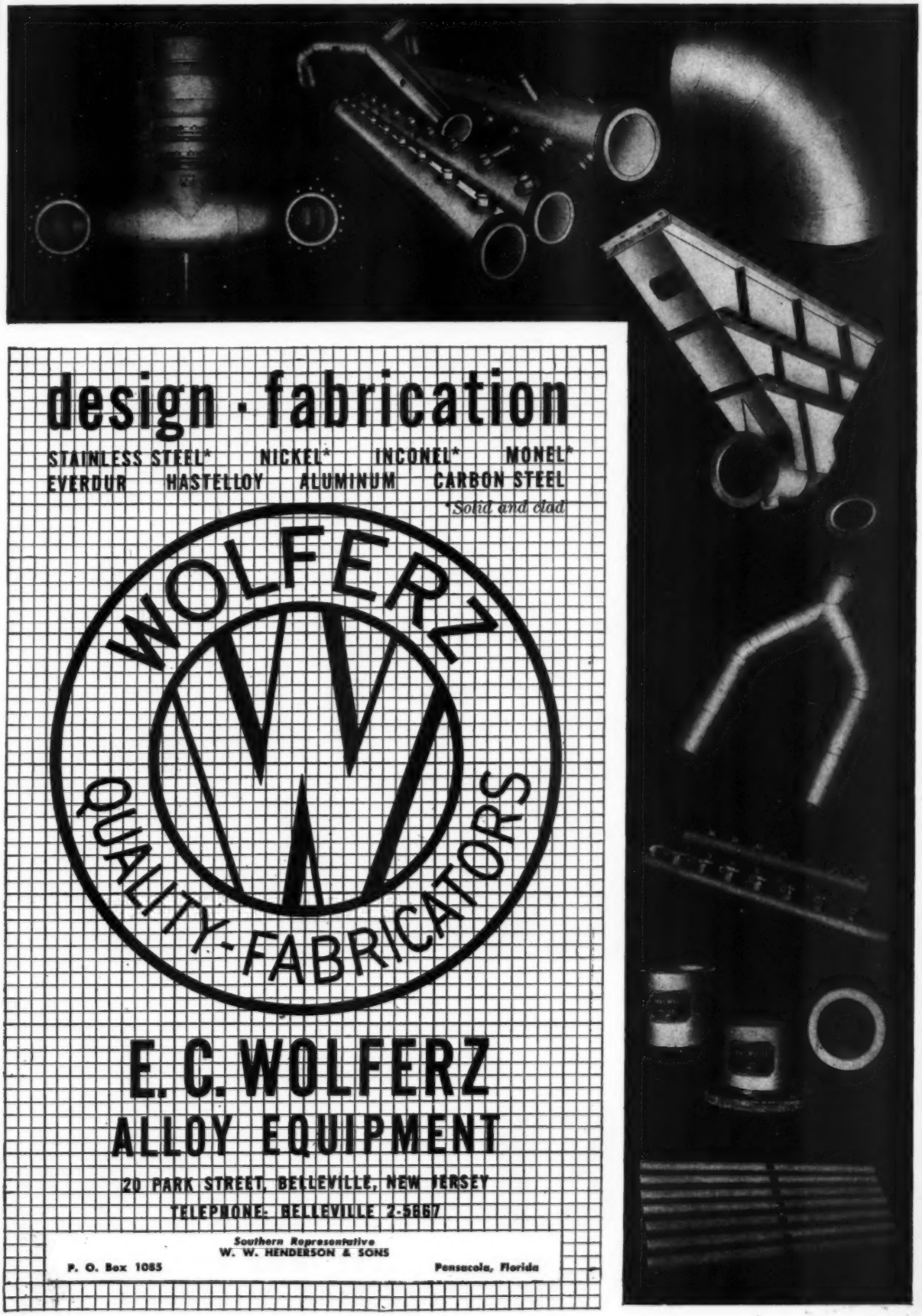
Specialties

Lily-Tulip Cup Corp., Augusta, Ga.
Old Colony Envelope Co., Westfield, Mass.
Scott Paper Co., Sandusky, Ohio
Lily-Tulip Cup Corp., Chicago
Line Material Co., Texas Fiber Products Plant, Sherman, Texas
Mid-West Wax Paper Co., Fort Madison, Iowa
Kimberly-Clark Corp., Appleton, Wis.
Lily-Tulip Cup Corp., Monticello, Ind.

Division III—Pulpwood Logging

Nekoosa-Edwards Paper Co., Michigan Woodlands
Nekoosa-Edwards Paper Co., Minnesota Woodlands

eland
Ga.
, La.
Plant
Co.,
Valley
eattle,
tville,
okuk,
Inc.,
more,
liana,
Falls,
burg,
boro,
tland,
Shore
Vis.
onio,
ogee,
Ark.
lphia
roud,
Los
Pa.
bert-
lean-
la.
Stur-
field,
rod-
ladi-
Vis.
nd.
igan
nne-
954



design · fabrication

STAINLESS STEEL* NICKEL* INCONEL* MONEL*
EVERDUR HASTELLOY ALUMINUM CARBON STEEL
*Solid and clad

WOLFERZ
QUALITY FABRICATORS

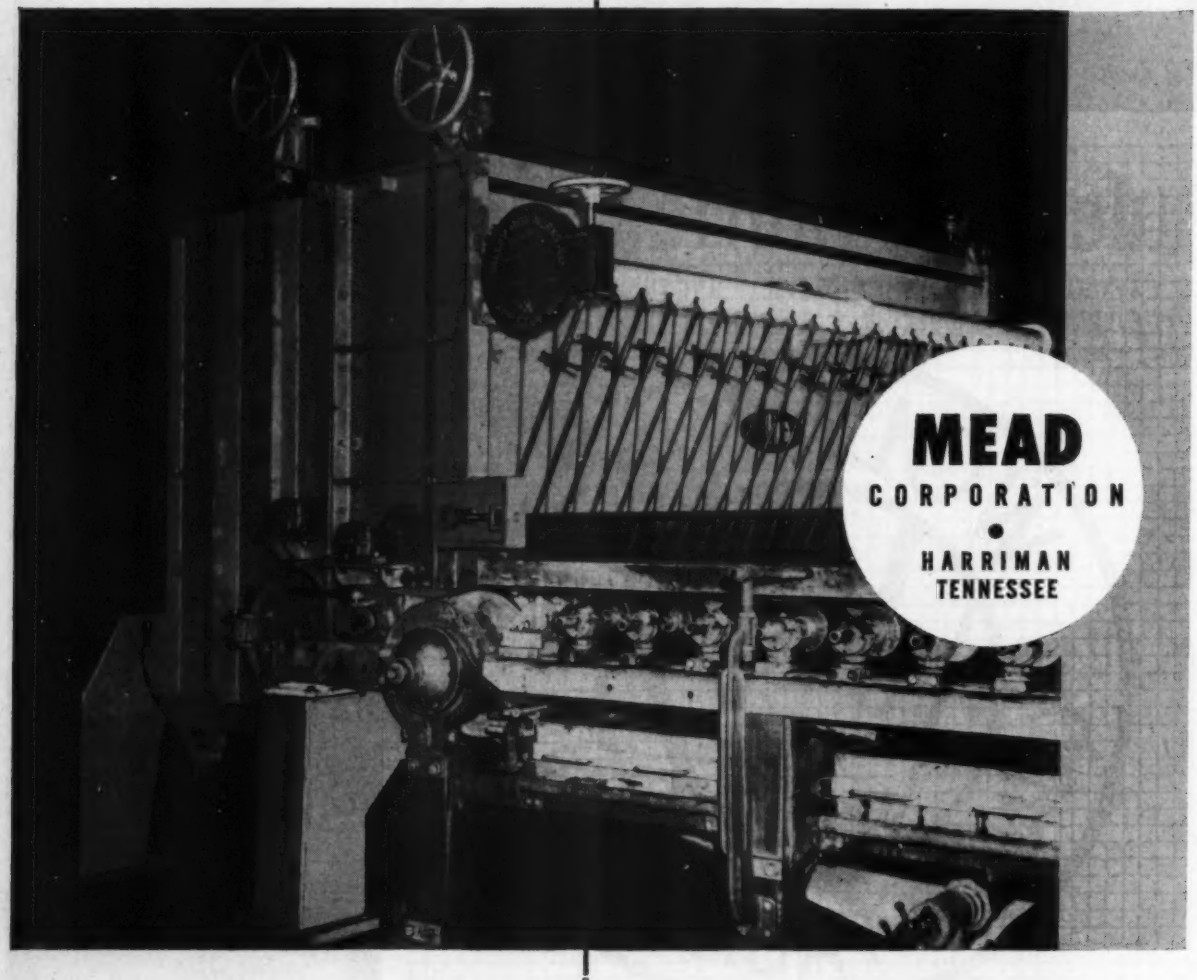
E. C. WOLFERZ
ALLOY EQUIPMENT

20 PARK STREET, BELLEVILLE, NEW JERSEY
TELEPHONE: BELLEVILLE 2-5867

Southern Representative
W. W. HENDERSON & SONS
P. O. Box 1085 Pensacola, Florida

ANOTHER

1954 START-UP



VALLEY STOCK ENTRANCE EQUIPMENT

write VALLEY IRON WORKS CO.
APPLETON, WISCONSIN

POSTERS

— A POTENT SAFETY TOOL

Posters should be one of the top aids in your safety program. No other safety medium can reach your entire audience—not once, but many times each day—with such low-cost safety messages. They are directed at the worker acts and worker attitudes that lead to accidents. Posters lend *timeliness, repetition and continuity* to your safety program . . . the three fundamental principles of direct selling.

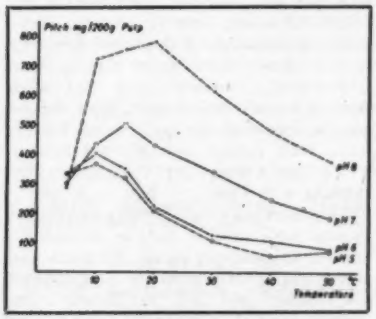
The National Safety Council maintains a stock of posters that covers all industries, operations and phases of safety and health. These posters are produced in three sizes: "A" size, 8½" x 11½"; "B" size, 17x23"; and "C" size, 25x38". Their colorful illustrations and eye-catching captions make them ideal for the mass selling of safety.

Write for a free copy of the Directory of Occupational Safety Posters. This 72 page catalog illustrates 744 posters, indexed and classified for specific operations.

NATIONAL SAFETY COUNCIL

425 N. Michigan Ave.
Chicago 11, Illinois

FOREIGN ABSTRACTS



Milligrams of pitch deposited on copper as a function of the temperature at various pH values

A study of pitch troubles in sulfite pulps

Details are given for determining the amount of pitch deposited from a pulp suspension on copper or stainless steel, under a variety of conditions. The apparatus used was described in a previous paper (Gustafsson, Tammela and Kahila, *Paper and Timber* [Finland], 34, 121 [1952]).

In the experimental procedure, 200 g. of pulp are stirred with 6 l. of water for two hours at 1440 rpm., keeping conditions such as temperature, pH, *et. al.* constant when necessary. The pitch deposited on the metal container and stirrer is dissolved in ether and the dry extract weighed. The properties of the pitch change very rapidly when pulp is exposed to the air, hence tests are carried out either with fresh pulps or with baled samples that have not been exposed. Factors dealt with include: pH, temperature, calcium ion, bicarbonate ion, surface-active agents and additives forming complexes with metallic ions.

The authors emphasize the fact that pulp *suspensions*, rather than the pulp *itself*, must be considered in determining the causes of pitch trouble. In other words, not only pulp quality but the properties of the media in which the pulp is suspended are important. This viewpoint is in harmony with the apparently whimsical nature of pitch troubles as found in mill practice.

At a given pH, pitch deposits pass through a maximum which depends on temperature (see the accompanying graph). When copper equipment is used, this maximum is greater, the higher the pH between 4 and 9, and the largest deposit is obtained at 20°C and pH 9. Such sharp differences are not noted when the stainless steel apparatus is used. Calcium ions (at a pH above 6 and at 40°C.) cause marked increases in pitch deposits (over those obtained with the same pulp suspended in distilled water). This is not the case at pH 4 to 6. Bicarbonate ions apparently exert no influence on pitch deposition and sodium ions are also without effect at pH 7 and 40°C. Magnesium ions are less effective than is calcium. Surface-active agents in pure water (at pH 5 and 7 and 40°C) have little effect on pitch. However, in the presence of significant amounts of calcium chloride, the amount of sticky pitch is lessened (at least with certain reagents). Sodium hexametaphosphate and sodium ethylenediamine tetra-acetate decrease pitch deposits, the latter very significantly. The use of alum at low pH is problematical, even though it may be quite effective at pH 7. If alum is used to reduce the pH, the ordinarily beneficial effects of this increased acidity may be lost completely.

Twelve graphs are given (of which the accompanying graph is typical). Two tables are also included. C. Gustafsson, V. Tammela, and T. Lindh. *Paper and Timber* (Finland), 36, 269-74 (1954) (in English).

Pulps from camphor and black wattle woods

The wood from the camphor tree is cooked both prior to and after extraction of the camphor. Sodium sulfite and sodium bicarbonate are used in the ratio of 7 to 1, and about 13-15 per cent chemicals are consumed in the digestion (when there is no pre-extraction). The yields are about 77 per cent. When the wood is cooked *after* camphor extraction, chemical consumption is 12 per cent (based on the oven-dried chips), and the yields are about 78-79 per cent. Pulp properties are very similar in either case, and paper strength is satisfactory.

Black wattle wood can be pulped by several procedures, including the semi-chemical neutral sulfite and the kraft methods. The lignin contents are low, whereas the pentosan contents are relatively high. Kraft pulp shows the best strength properties. Masao Tayama and Skukuro Ishikawa. *J. Japan. Tech. Assoc. Pulp & Paper Ind.*, 7, No. 3, 14-18 (1953) and No. 4, 7-11 (1953) (original in Japanese) (through C.A., 48, 7298 [1954]).

Aspen hybrids in Norway

In various Swedish tests, it was shown that hybrids of *Populus tremula* with *Populus tremuloides* grew more rapidly than *Populus tremula* alone. Tests were also begun in Norway in 1948, with aspens brought in from Denmark and, two years later, with those introduced from Sweden. Owing to poorer soil conditions in Norway and to the use of only a very limited number of types of hy-

"THIS LUBRICANT INCREASED BEARING LIFE FROM 2 WEEKS TO 2 YEARS"

—says THE GLOBE COMPANY

"Animal acids and moisture, most harmful to ball and roller bearings prevails in the entire meat packing industry. With conventional lubricants, some of the bearings in our Roto-Cut machines did not last two weeks. Since using Ball Bearing LUBRIPLATE in machines operating continuously 24 hours a day for over two years, we have not had a single bearing replacement."

REGARDLESS OF THE SIZE AND TYPE OF YOUR MACHINERY, LUBRIPLATE GREASE AND FLUID TYPE LUBRICANTS WILL IMPROVE ITS OPERATION AND REDUCE MAINTENANCE COSTS.

LUBRIPLATE is available in grease and fluid densities for every purpose... LUBRIPLATE H. D. S. MOTOR OIL meets today's exacting requirements for gasoline and diesel engines.

For nearest LUBRIPLATE distributor see Classified Telephone Directory. Send for free "LUBRIPLATE DATA BOOK"... a valuable treatise on lubrication. Write LUBRIPLATE DIVISION, Fiske Brothers Refining Co., Newark 5, N. J. or Toledo 5, Ohio.

Foreign Abstracts . . .

brids, the results were far less promising than were those in Sweden. However, it was shown that *Populus tremula* (alone) can certainly not be used for reforestation. The rate of survival and growth was much too low (and this high death rate was also true for some of the hybrids). However, even in Norway, under relatively unfavorable soil conditions, the hybrids grew much more rapidly than did *Populus tremula* alone and often showed better survival rates. Root suckers usually exceeded the growth of hybrids (*i.e.*, main stems), but this was thought to be just a temporary phenomenon, decreasing with time.

The hope is that Norwegian poplars crossed with suitable *Populus tremuloides* introduced from the North American continent might finally meet the conditions of the climate and soil in Norway. The author gives a number of growth and survival figures and two half-tones. Martin Hausberg. *Norsk Skogindustri*, 8, No. 5, 180-4 (1954) (in Norwegian with English summary).

Acid-resistant linings

The article, which is a digest in English of a paper published in Finnish (*Paperi ja Puu*, No. 5, 1954), deals with the linings of sulfite digesters, storage tanks and acid towers. Fig. 1 shows schematically a typical lining for a sulfite digester and/or an acid tank. Fig. 2 shows the construction of the lining of an acid-chamber, gratebearer or tower section in an acid tower.

The author points out certain precautions. Whereas engineers are aware that cooking must be done very carefully in recently lined digesters, or in digesters that have been kept idle for some time, attention is rarely given to the maintenance of a digester that is not in use. The suggestion is made that when a digester is idle for more than two weeks, it should be filled with weak acid (containing about 1 per cent SO_2). This prevents shrinkage and cracking.

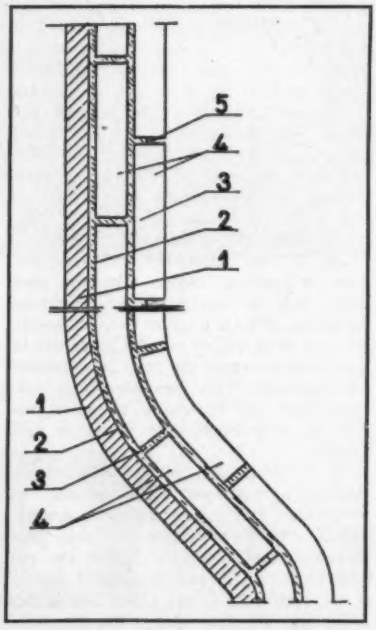


Fig. 1—(1) Shell; (2) isolation mortar (3 mm.); (3) acidproof mortar (2 x 10 mm.); (4) ceramic bricks (40 mm.) and carbon bricks (40 mm.), and (5) acidproof resin

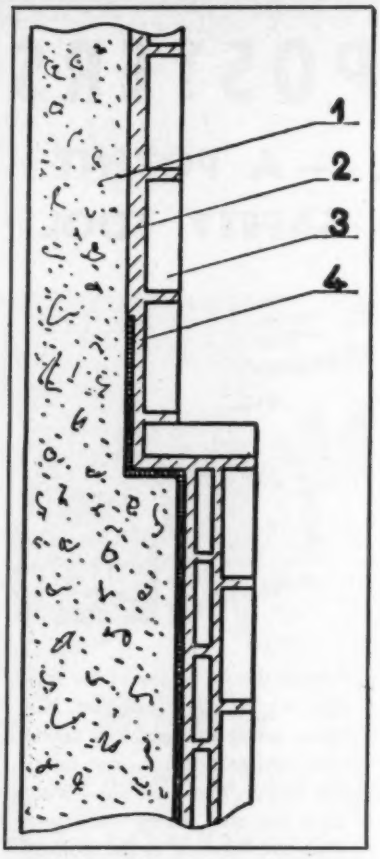


Fig. 2—Lining method of the acid chamber, the gratebearer and the tower section in the acid tower at sulfite mill. (1) Concrete construction; (2) acidproof mortar; (3) ceramic bricks, and (4) acidproof bitumen composition

In digesters in which sodium or ammonium bases liquors are used, the bedding of the digester wall is lined normally with ceramic bricks using water glass mortar; but there is also a layer of carbon brick held in place by an acidproof resin. The Swedish method of using two layers of ceramic bricks is discounted.

The distribution of temperatures and thermal expansions and the pre-stresses in sulfite digesters are discussed. K. A. K. Sallinen. *Finnish Timber and Paper*, 5, No. 4, 33-35 (1954) (in English).

Studies with a Karlstrom barker

A critical study is made with the Karlström barker by Professor Brecht and his co-workers of the School of Technology at Darmstadt. The object is to show the effects of this type of barking on subsequently manufactured chips and pulps.

Provided the wood has been stored a year or less before barking, the fiber losses are extremely low and the bark is removed easily. When storage is more extended, the cambial zone adheres to the wood. Because the period of steaming before barking is quite protracted, the thermal requirements of the barking system are high, and there is a marked darkening of the wood which later results in losses in brightness of 4-7 per cent in the case of mechanical pulp and 3-5 per cent in sulfite pulps.

On the other hand, the groundwood from wood barked by the Karlström barker contains longer fibers than those usually obtained, and the strength properties of the pulp are higher. When chemical pulps are to be prepared from such barked wood, it is found that more utilizable chips are formed, and the resin content of these chips is also reduced. However, the investigators do not substantiate the manufacturer's claim that the bark can be easily removed by the barker on chilling the wood. Walter Brecht, Rudolf Bott and Martin Wenz. *Das Papier,* 8, 120-128 (1954) (in German).

Changes in fiber length during the beating operation

Whereas the average change in fiber length that occurs on beating is important, the change in fiber-length distribution plays a very significant role, in characterizing the shortening of fibers. The article is in large part mathematical; a statistical procedure is outlined which permits the calculation of fiber-length distribution when the probability of shortening for every fiber length is known. From experimentally determined fiber-length distribution curves, this probability can be calculated. On the basis of his studies, the author claims that he can tell whether the beating action has involved cutting or whether the action was one of crushing the fibers.

Data are given both for work carried out with the Rieth beater and with the Jokro mill. Heinz Corte. *Das Papier,* 8, 163-72 (1954) (in German).

Papermaking properties of bamboos from the Belgian Congo

The chemical composition and morphological structure of seven species of bamboo are studied and their suitability as papermaking materials is discussed. There seems to be no essential difference between African and Asiatic bamboos. Orienting cooks indicate that prehydrolysis, a sodium sulfide-caustic soda ratio of 1:3 with a sulfidity of 25 per cent and maximum cooking temperature of 165° C., gives rise to pulps that can be bleached, using a five-stage bleaching operation and a final sulfur dioxide wash. Yields of the bleached pulps vary from 42 to 46 per cent. In general, the silica content of such (unbleached) pulps is low, but an exception is that from *Bamboosa vulgaris.*

Analytical data are given for unbleached but not for bleached pulps. The authors feel that these preliminary data indicate that the papermaking characteristics of bamboo pulps may be more favorable than those obtained from mixed tropical hardwoods. Seventeen tables and 12 references are given. J. R. Istas and J. Hontoy. *Publications Inst. National Etude Agron. Congo Belge, Tech. series,* 41, 23 (1952) (in French) (through *Bull. Inst. Paper Chem.,* 24, 784 [1954]).

Optical brighteners used in the paper industry

The author discusses the function of white pigments, bluing agents and brighteners and gives the chemical structures of various commercial brighteners. Special reference is made to brighteners of the coumarin type (which are not used in papermaking) and of stilbene derivatives. The relationship between chemical constitution and brightening is discussed, as well as the fluorescence of the various brighteners. The latter are usually added to the stock in the beater, although they can also be introduced at various points on the paper machine, and even on the finished sheet.

Brighteners can be applied successfully to well-bleached kraft and sulfite pulps, and the source of such pulps is immaterial. Even when bleached, groundwood interferes with the action of brighteners; and, in the case of waste paper, brighteners can only be applied successfully when groundwood and dyed papers are originally absent.

Brighteners may be applied in conjunction with loading materials, white pigments, starch, dextrins, casein, gelatin, car-

This Machine will WRAP, SEAL and LABEL Ream Packages TEN per MINUTE —

ONE AUTOMATIC OPERATION • ONE OPERATOR

WRITINGS • BOOKS • COVERS
CLEAN • TAILORED PACKAGES

Fully automatic • Handles sizes ranging from HEAVIER through 23 x 35 — bulk 1" to 3". Adjustable to your specific requirements • Larger sizes on request • Let us show you how this machine will improve packages, and amortize itself in a year or less on normal volume.

Individual Labeling Units available for operating in efficient combination with your own Wrapper.

Our engineers invite a consultation with you on new developments for time and labor saving.

Write, Wire or Call

GRISWOLD and JOHNS

Engineers and Builders of Special Automatic Equipment

111 W. Jackson Blvd., Chicago 4, Illinois

boxymethylcellulose and flameproofing materials, but not with methylated cellulose or methylated starch.

"Unitex" (a brightener the structure of which is not given) seems to be applicable in wrappings, which it renders impermeable to ultraviolet light, thus serving to protect perishable foodstuffs. The article includes samples of paper treated with Unitex.

The author points out that the usual control testing instruments are not used to evaluate brightening action. Visual testing methods are outlined for such evaluations. A. E. Siegrist. *Das Papier*, 8, 109-20 (1954) (in German).

Packaging so as to render goods proof against tropical climates

The climatic conditions in the Belgian Congo are particularly difficult for the packaging industry, due to high humidities and wide temperature variations, *et al.* For example, the standard tropical packaging is satisfactory for the harbor at Leopoldville but hardly satisfactory for the center and eastern parts of the colony, due especially to frequent reloadings (sometimes as many as seven), with possible concomitant exposure to tropical rains, handling by native labor and, at best, high moisture conditions.

As a result, Belgian corrugated board manufacturers are studying the problem of developing a special board for the Congo; possibilities include treatments with paraffin and micro crystalline waxes on the inside and/or outside, the use of bitumen-treated kraft paper as an outside facing, and wet-strength treatment of the entire board by beater sizing. Of these three, the last named seems the most promising. L. Huughe. *Verpackungs Rundschau*, No. 2, 72 (Feb. 1954) (through *Bull. Inst. Paper Chem.*, 24, 814 (1954) (original in German).

STARCHES
DEXTRINES
GUMS
LYCOID®

Laboratory control assures uniform quality

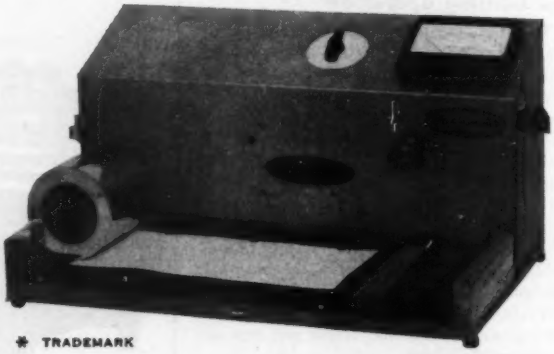
STEIN HALL
285 MADISON AVENUE NEW YORK 17, N. Y.

ESTABLISHED 1866

Atlanta, Boston, Charlotte, Chicago, Cincinnati, Detroit, Los Angeles, New Orleans, Philadelphia, Portland, Providence, Rochester, San Francisco, St. Louis, Toronto, Montreal

PAPER MANUFACTURERS AND PRINTERS RECOMMEND THE

Vanceometer*
Oil Absorption Tester



* TRADEMARK

- TO OBTAIN A NUMERICAL RATING OF ABSORPTION INTO PAPER AND PAPER BOARD.
- TO TEST PLAIN OR COLORED STOCK.
- TO GET SURE RESULTS QUICKLY

HILLSIDE LABORATORY
25 HOWARD AVENUE HILLSIDE, ILLINOIS

ENGLISH ECCO CLAYS TRADE MARK CLAYS

UNIFORM • SUPERIOR • DEPENDABLE

English China Clays Sales Corporation
551 Fifth Avenue, New York City

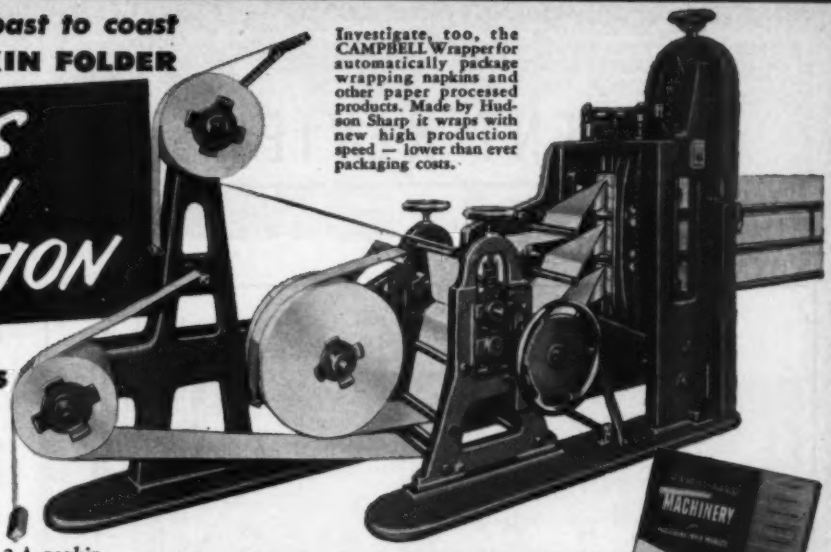
In plant after plant... coast to coast
Hudson Sharp's NAPKIN FOLDER

SPEEDS NAPKIN PRODUCTION

to meet
EVER-INCREASING DEMANDS

- Multiple web production
- Separate or unison operating webs
- One person "unskilled" operation
- Printing and embossing units available
- Accurately cuts and folds all napkins square

"Standard" of the industry, the HS No. 2-A napkin folder is built in all popular and special sizes for the production of either plain or facial quality type table napkins. Machine handles three or more webs at one time and unique folding mechanism makes it impossible to cut or fold a napkin out of square. Printing or embossing equipment can be supplied as required. Completely rotary in operation, the machine's simplicity of design, construction and operation makes it unnecessary to employ a skilled operator. Besides folding paper table napkins this same machine is producing many other paper and cellulose products requiring cutting and folding. Many exclusive features afford the utmost in speed, efficiency and economy. Complete details and descriptions upon request.

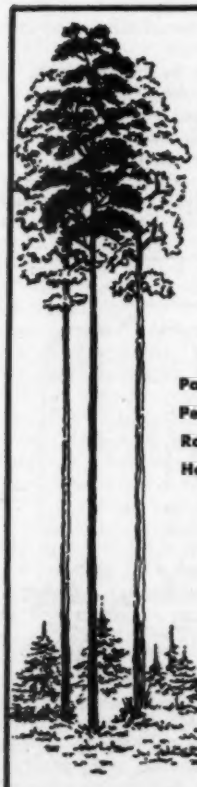


Investigate, too, the CAMPBELL Wrapper for automatically package wrapping napkins and other paper processed products. Made by Hudson Sharp it wraps with new high production speed — lower than ever packaging costs.

HUDSON-SHARP
MACHINE CO · GREEN BAY · WIS
Manufacturers of
Printers, Embossers, Folders, Interfolders, Waxers, Laminators, Wrapping Machines, Core Winders, Packaging Presses, Crepers, and Napkins, Toilet Tissue and Paper Towel Units.

NEW YORK • 55 WEST 42ND STREET

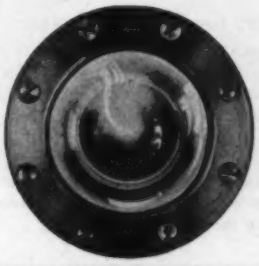
Write for new brochure showing our complete line of machines for processing paper, film and foil products. No obligation, of course!



WILLIAMS-GRAY COMPANY
221 North La Salle Street
Chicago 1, Illinois

Paul Foster
Peter Talbot
Ross Lawrence
Herb. Fishburn

Lindsay & Niagara Wires
Knox "Excelsior" Felts
Cotton & Asbestos
Dryer Felts
Carrier Rope
Splicing Tissues
Dackle Webbing
Apron Cloth
Wire Brushes



TAKE A QUICK LOOK...
AND HEAD OFF TROUBLE

Install Midwest Ball Sight-Flow indicators on several of your dryer discharge lines and, at a glance, check the condensate flow.

Any reduction of the flow will alert you to trouble—bad joint or bad syphon, or both.

The "window" is self-cleaning, the flow always visible, and so guaranteed.

Built of non-corrosive materials and in all required pipe sizes. Designed for 125# steam pressure.

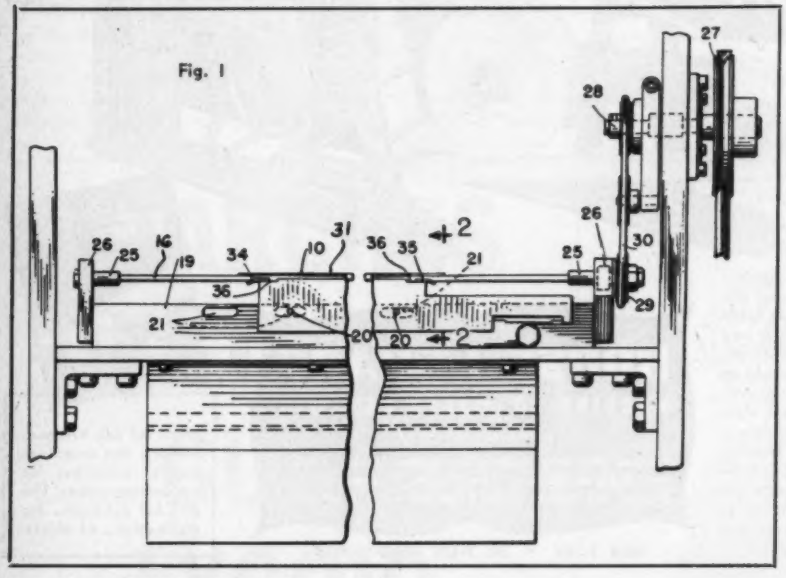
Get a few and they'll prove their worth.

Thermometer attachment to check temperatures optional.

ROSS MIDWEST-FULTON CORP., DAYTON, OHIO

MIDWEST
BALL SIGHT-FLOW INDICATORS

PATENT REVIEWS



MELVIN NORD*

Apparatus for Coating Paper

In the manufacture of paper coated with lacquer it is customary to apply lacquer to one face of the web, then spread and take off excess lacquer with a doctor blade. In such coating operations it has been very difficult in the past to apply lacquer between precise margins, particularly if the web being coated shifts somewhat during the coating operation.

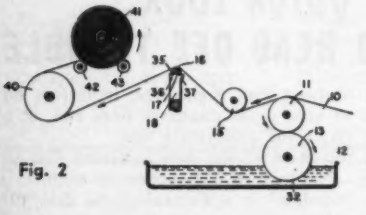


Fig. 2

The object of U.S. 2,672,119, issued March 16, 1954 to E. W. Ertner and assigned to Western Electric Co. Inc., is to overcome this problem.

The apparatus is shown in Figs. 1 and 2. A web 10 is advanced continuously by the rolls 42 and 43 over the applicator roll 11, the doctor roll 16, and the drying drum 40. The applicator roll 11, which is of a width less than that of the web 10, applies a band equal to its width to the web 10. As the coated portions of the web are advanced over the roll 16, the roll wipes excess lacquer off and smooths the portions left on; most of the lacquer removed from the web 10 by the roll 16 falls back into the tank 32, while the portion scraped from the roll 16 at the U-shaped pins 34 and 35 is accumulated and spread by the pins outwardly. Uncoated portions of the web contact the lacquer accumulated along the pins, which lacquer coats these portions of the web, thereby widening the area of the portion of the web 10 which is coated with the lacquer.

*Patent attorney, 17600 Pinehurst, Detroit.

•

Manufacture of Pulp by the Alkaline Process

U. S. 2,671,727, issued March 9, 1954 to Dana B. Westcott and Harold L. Field, assigned to West Virginia Pulp & Paper Co., relates to a process for the manufacture of pulp by alkaline cooking.

A number of digesters is served by a single accumulator for cooking liquor through which and through each digester in operation a continuous circulation of liquor is maintained. The alkali concentration and temperature of the liquor are maintained by fortification with alkali and with heat before the liquor enters the digesters. By passing the liquor through the digesters in parallel with sufficient speed, the drop in active alkali concentration and in temperature are kept within narrow predetermined limits. When the cooking of a charge in a given digester is complete, such digester is cut out of the system and blown.

Cooking a charge by bathing it in a flowing stream of cooking liquor which is continuously maintained within an optimum range of active alkali and of temperature has signal advantages, among which may be mentioned (1) a higher grade of pulp as indicated by a higher viscosity number

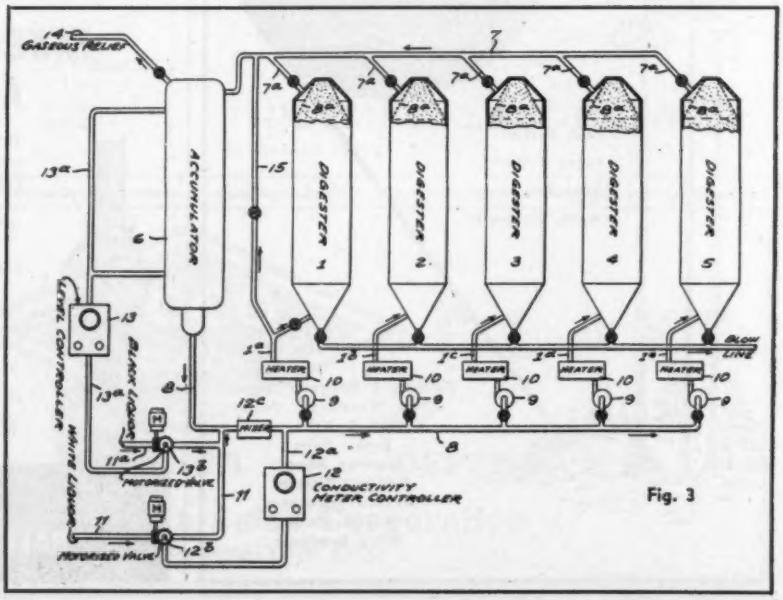


Fig. 3

due to the absence of high initial alkali concentrations as is the practice in the ordinary cooking operation, and also due to the fact that there is less pulp which is either overcooked or undercooked; (2) greater use of the digester capacity inasmuch as the digester may be completely packed full of chips; (3) since the cooking liquor is continuously fortified it is possible to use the liquor until it has a greater solids content before sending it to the evaporators, with substantial economies in evaporator operation; (4) the system results in cleaner blows; (5) complete submergence of the chips is accomplished since the digester is fully charged with liquor; (6) there is no need to weigh or measure the amount of chips charged the digester or to determine in advance the moisture content of the charge.

In Fig. 3, there are shown digesters 1, 2, 3, 4, and 5, each of which is in communication with an accumulator 6 by means of pipe 7 connected to the top of each digester by valved branch pipes 7a respectively; the return flow from the accumulator passes through pipe 8 and then into offtakes 1a, 1b, 1c, 1d, 1e, respectively, leading to the bottom of digesters 1 to 5. Each of said offtakes has in its circuit a pump 9 and a heater 10. Each of the heaters is of the heat exchanger type in which the charge is indirectly heated by steam admitted by connections not shown. Each digester has a strainer 8a preferably located in the extreme top thereof.

Fresh white liquor for maintaining the active chemical concentration is admitted, preferably continuously, to the volume of liquor in circulation by means of pipe 11 which joins pipe 8. Spent black liquor from the pulp washers (not shown) is similarly admitted through pipe 11a and serves to maintain the necessary volumetric level. The feed rates of both the white liquor and black liquor injected can, if desired, be made fully automatic. Since the active soda concentration is a direct function of the electrical conductivity of the cooking liquor, the active soda concentration may be maintained at a fixed level automatically by a conductivity controller 12 which measures the conductivity of a small sample of cooking liquor withdrawn continuously from pipe 8 through pipe 12a at a point after the new chemicals are added, and controls this measured conductivity at a fixed point by actuating motorized valve 12b placed on white liquor pipe 11. A mixing chamber 12c may also be provided in line 8 and may contain a motorized stirrer not shown to insure thorough mixing of the added liquors. A differential pressure type level controller 13 connected to accumulator 6 by piping 13a may be used to measure the level in the accumulator and control this level between a suitable range by energizing a motorized valve 13b on the black liquor pipe 11a.

The air charged with the chips and any gases produced during the pulping reaction are carried by the circulating liquor from the digesters 1-5 to the accumulator 6. These gases are continuously relieved to the atmosphere from one point line 14.

Details of operation in a particular case are given in the patent specification.

NO TRAFFIC JAMS HERE

Pulp line traffic always flows smoothly through lanes of Naylor light-weight pipe. Easy to handle and easy to install, this distinctive lockseamed-spiralwelded pipe will handle your requirements on stock lines, water lines and air lines—safely, dependably, economically. You'll find Naylor fabrication service the practical answer for producing special designs in all types of metal to meet your specific layout requirements. Ask for Bulletins No. 507 and No. 525 to get the complete story.

NAYLOR PIPE

Naylor Pipe Company • 1233 East 92nd Street, Chicago 19, Illinois

Eastern U.S. and Foreign Sales Office: 350 Madison Avenue, New York 17, New York

Sulphur

from the mines of

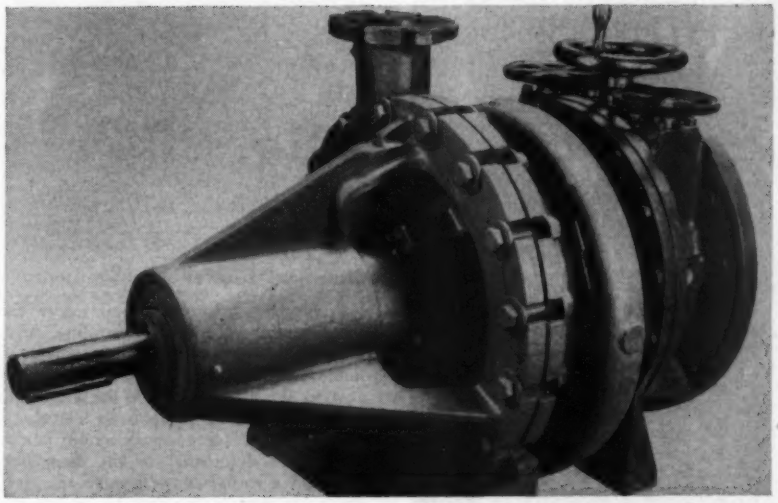
Texas Gulf Sulphur Co.

75 East 45th Street, New York 17, N. Y.

Sulphur Producing Units

- NEWGULF, TEXAS
- MOSS BLUFF, TEXAS
- SPINDLETOP, TEXAS
- WORLAND, WYOMING

NEW PRODUCTS



Centrifugal pump

A new variable capacity-variable head centrifugal pump (Type ACAP) for use in handling any consistence from water up to five per cent paper pulp under varying capacity and head conditions has been announced.

The new pump consists of an internal by-pass bolted directly to a remachined single-action centrifugal pump. It is currently being used in a number of mills in conjunction with a paper stock pump to control capacity and head from maximum value down to zero. The power requirement is almost constant over the entire range of operation, according to the manufacturer.

The new unit resembles a standard single suction pump with an extension bolted in place. Circular motion on the operating mechanism is used to change the clearance between a revolving impeller and a stationary wear plate cylinder, thereby controlling the flow from the discharge nozzle of the pump by by-passing fluid within the pump.

While the new unit may also be applied to fan pump and machine head box supply service, as well as many other applications where variable head and supply is desired, it is not intended for application to existing or installed pumps since the cost of dismantling and remachining such units would be prohibitive. *Allis-Chalmers Manufacturing Co., Milwaukee 1, Wis.*

Strip chart recorders

Two new electronic strip chart recording instruments designed to record 10 and 20 points have been introduced.

The new 20-point strip chart recorder yields 25 per cent more data than 16-point recorders without a proportionate increase in either size or maintenance expenses, according to the manufacturer. It is particularly suited for such installations where a quantity of information is required but where measurement is limited either by cost or space considerations. *Minneapolis-Honeywell Regulator Co., Industrial Div., Wayne & Windrim Aves., Philadelphia 44, Pa.*

Roof valve

A roof unit for industrial buildings which opens quickly when excess interior heat occurs has recently been developed. Called a "fire valve," it was developed to meet the newly recognized need for fast release of heat, gases, and smoke in the event of fire.

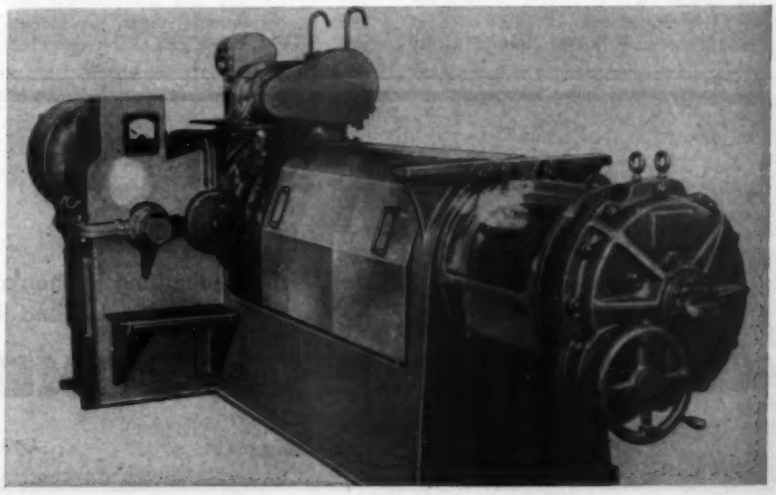
Each unit of the fire valve provides 46 sq. ft. of free area opening when two large dampers drop, released by a fusible link device. Dampers can also be opened and closed by a loop chain when desirable to use the unit for extra ventilation in good weather. The unit is weatherproof when closed. Any number of fire valves can be installed on a roof to meet recommendations of fire and insurance authorities. *Swartwout Co., Cleveland, Ohio.*

Continuous screw press

The new "Pressafiner" is a continuous screw press with two separately driven screws assembled of interchangeable stellited parts. The feed screw rotates at relatively high speed. The compression screw rotates at lower speed and develops pressures up to 8,000 psi.

Mill operation and laboratory tests to date are said to have demonstrated the following advantages: highly concentrated liquors are removed from cooked chips, knots, and screenings; expression of liquor simplifies the problem of avoiding stream pollution; steamed, cooked, or raw chips are fiberized to the extent of breaking down shives, improving subsequent refining, and reducing the power requirement; the head of compaction mildly steams or cooks materials in the Pressafiner; water usage is reduced with a consequent saving in cost of pumping and disposal; final products are usually improved in appearance, mullen, and tear; higher yields can be obtained if Pressafiners are used ahead of conventional refiners, and bark and rejects can be dewatered to create a combustible fuel.

The foregoing advantages of this continuous screw press have been demonstrated over a period of only 18 months. Other advantages are foreseen by the manufacturer as the result of further laboratory tests and mill applications. *Bauer Bros. Co., 1759 Sheridan Ave., Springfield, Ohio.*



for a . . .
PERFECT SHEET
use
WISCONSIN
Perfect Surface
WIRES
for . . .
PERFECT PERFORMANCE
their is none better!
Expertly made with finest precision equipment from exrta select wire. Backed by years and years of ex—perience is your assurance of the very best.
IF YOU HAVE NOT SEEN OUR COLOR FILM "WEAVING WISCONSIN WIRES" WE WILL BE PLEASED TO SEND IT TO YOU!
WISCONSIN Perfect Surface WIRES
© 1953
WISCONSIN WIRE WORKS
APPLETON, WISCONSIN

New Products . . . . . .

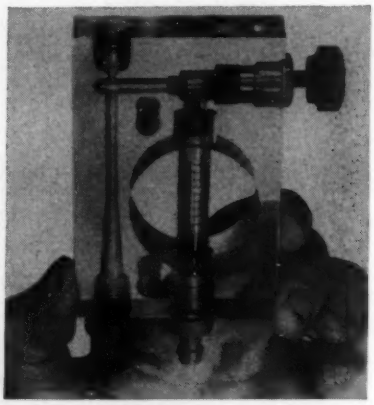
Blind for piping transfer systems

A new blind designed to increase the safety and simplicity of mechanical blinding operations in fluid product piping transfer systems has been introduced. It consists of two straightway Nordstrom Hypreseal valves butted together in series and operated in unison through a common linkage.

A bleeder valve is located between the two Hypreseals and is also operated through the same linkage in such a way that when the two block valves are turned to the closed position the bleeder is automatically opened.

This blind, the manufacturer claims, is the first to offer a double block with automatic bleed, eliminating shut-off of upstream and downstream valves and bleeding the section between blinds. Drainage losses also are avoided this way, as well as the danger of large volumes of escaping vapor.

Use of the new blind obviates the necessity for precise piping alignment to prevent binding in the blind. As an important additional safety feature, the blind prevents pressure build-up and the resulting hazards of conventional blinds. A tamper-proof locking device and simple one-wheel operation are also cited as advantages of the new device. *Rockwell Manufacturing Co.*, 400 *N. Lexington Ave., Pittsburgh* 8, *Pa.*



Chemical feeder

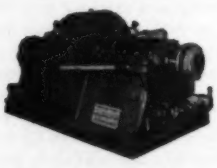
A rugged, compact chemical feeder for simultaneously metering, controlling, mixing and dispensing small proportions of liquid chemicals into liquid streams is now on the market. Called the Feedrator, it includes a built-in ejector which eliminates the need for a proportioning pump. A pressure differential in the main line to create a by-pass flow through the ejector is all that is necessary to operate the unit.

Many corrosive chemicals can be fed directly into the main stream because the unit is enclosed in a Lucite block. For chemical additives which Lucite cannot handle satisfactorily, the Feedrator block is also available in Uscolite at some additional cost.

The small size of the body block, 4¼ by 2¾ in., provides ease of mounting and low cost. The pipe line adaptor screws directly into the unit's body block, requiring no additional fittings.

Reagent flow is precisely controlled with the needle valve built into the unit. The unit comes in four standard models with reagent capacities ranging from .03-0.3 to 2-20 gal. per hour. Should water pressure suddenly drop, a positive check against backflow of feedwater into the reagent tank is provided by a ball check valve between the metering tube and ejector.

According to the manufacturer, some of

proven
by
performance

The Sutherland Refiner complete continuous Beating and Refining Systems.*
SUTHERLAND REFINER
CORPORATION
*U. S. Patent No. 2,654,295
TRENTON 8, NEW JERSEY

Sulphite Mill Acid Plants
Semichemical Liquor Plants

Sulphur Burning Plants • Jenssen Two Tower Acid Systems • Gas Coolers—Surface and Spray Type • Jenssen Pressure Acid Systems • Jenssen Auxiliary Process Towers • Recovery Plants—Cooking Acid

SOLUBLE BASE ACID PLANTS
JENSSEN SO_2 ABSORPTION SYSTEMS

For Bleach Plant Application—Sulphurous Acid Preparation
COMPLETE DESIGN AND INSTALLATION

G. D. JENSSEN CO., INC.
WATERTOWN, NEW YORK

WESTERN REPRESENTATIVE:
JAMES BRINKLEY COMPANY, Seattle, Washington

New **RESLIN SUCTION BOX COVER**
PROVEN BY TEST
..OFFERS THESE FEATURES:

Even distribution of fabric assures EVEN WEARING. Ends of threads contact wire assuring uniform surface to wire. Increased wire life. Many years of trouble free service. Resurfacing reduced to a minimum. Does not absorb water. Doesn't contract or expand. Requires no wet storage or care when machine is down. Easily installed. Greater strength and rigidity. Greater open area.

MAKE YOUR SUCTION BOX COVER A RESLIN AND GAIN ALL THE ADVANTAGES OFFERED BY THIS NEW DEVELOPMENT IN SUCTION BOX COVERS.

WRITE FOR FURTHER INFORMATION

APPLETON WOOD PRODUCTS CO. APPLETON - WISCONSIN

the applications in which the chemical feeder is proving successful are: hypochlorination of water, treatment of slime control, addition of anti-foaming agents, rust and scale inhibition in pipes and boilers, and laboratory dilution of reagents. *Fischer & Porter Co., 19 Jacksonville Rd., Hatboro, Pa.*

Sprockets

Extension of the "off-the-shelf" line of Taper-Lock sprockets to include the 1½, 1¾ and 2 in. pitch sizes has been announced. This means that users of single strand roller chain will now be able to secure sprockets and bushings for chain sizes from 40 through 160 direct from distributors' shelves, ready for immediate installation without delay for reboring, keyseating, drilling and tapping.

All Taper-Lock sprockets in the new larger pitches, up through the 26-tooth size, will be made of high carbon steel and can be hardened. Larger sprockets will be available in close-grained semi-steel. *Dodge Manufacturing Corp., Mishawaka, Ind.*

High temperature thread compound

A new high temperature compound that protects against the welding action of threaded connections subjected to prolonged exposure to heat has been developed. Known as "Thred-Gard," it is said to eliminate seizing and galling at operating temperatures up to 1200° F.

The compound is non-hardening and acts as a lubricant to allow easy dis-assembly of threaded connections, even after lengthy service under the most severe conditions. According to the manufacturer, not only is dismantling time greatly reduced, but damage to stud, pipe joint and plug threads is prevented, thus permitting their re-use many times over.

By reducing wrench torque, this compound is said to allow fittings to be drawn up to a greater degree of tightness without undue stress or strain. It acts as a protective coating to keep threaded surfaces smooth and insure pressure-tight, metal-to-metal contact. *Crane Packing Co., Dept. PIC, 1800 Cuyler Ave., Chicago 13, Ill.*

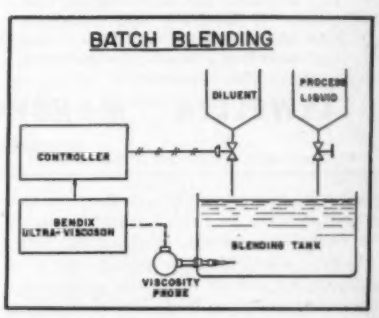
Paper size

A new, complete paper size, Mersize RM Dry, has been introduced to the industry in commercial quantities. It is said to have the optimum degree of fortification for the highest sizing efficiency. Extensive laboratory and field tests have shown the new material to be highly efficient in sizing a variety of papers. It may be used directly without first being put into solution.

Mersize RM Dry, it is claimed, permits sharp reductions in the amount of size compared with rosin size and resultant dollar savings of about 30 per cent with no loss of sizing test. It is also said to minimize the effect on sizing of variations in furnish and paper machine conditions.

The new product, which may be added directly to the beater in dry form, or as a water solution, is said to be rapidly soluble in cold water and to result in a clear, light-colored solution.

Storage tests under extreme conditions of high moisture and high temperature have indicated outstanding aging characteristics, as measured by foam index, color and trouble-free handling, it is claimed. The use of this size does not require modification of mill practice or equipment. *Monsanto Chemical Co., Organic Chemicals Div., St. Louis 4, Mo.*



Viscosity measuring instrument

The new "Ultra-Viscoson" viscosity measuring instrument, utilizing ultrasonic principles, is now offered in a complete line of indicating, recording and control systems which feature a new approach to process control through viscosity.

The versatility of these systems can be emphasized by the fact that they can be

proven by performance

Sutherland High Yield Kraft System*

SUTHERLAND REFINER CORPORATION

* U.S. Patent No. 2,591,106

TRENTON 8, NEW JERSEY

LEWELLEN

Automatic

CALIPER CONTROLS

SIMPLE . . . DURABLE . . .

AMAZINGLY ACCURATE!

Lewellen Automatic Caliper Controls actually measure the board as it is being made, and automatically make stock adjustments to maintain uniform caliper at any speed. They assure simple operation, durability, and truly amazing accuracy. No intangible electronic guesswork.

HERE'S A CASE IN POINT. The installation shown here consists of two complete Lewellen automatic caliper controls, rebuilt last year to include all improvements Lewellen has developed since 1927. *Today, uniform caliper is maintained within .00025"!* Exact thickness is measured, and continuous automatic adjustments are made at the stock gate to compensate for any variation. The quality of materials and workmanship that go into Lewellen automatic controls practically eliminates adjustment and maintenance.

This control has been in continuous operation for 26 years. In 1953 it was completely rebuilt, and every improvement developed since its initial installation was incorporated into it.

THE MORE UP-TO-DATE YOUR EQUIPMENT, the better job Lewellen controls can do for you. Make sure your caliper is controlled by Lewellen . . . the company with 29 years of experience in the manufacture and installation of caliper controls. We will custom-engineer your controls right on the job, to meet any special conditions . . . and you'll find they pay for themselves by eliminating complaints and by savings in stock. Write for complete information.

LEWELLEN MANUFACTURING COMPANY

COLUMBUS, INDIANA

employed very successfully in the pulp and paper industry to control batch blendings of resins and coatings, checking viscosities of the various liquors, asphalt oxidation and asphalt cutback in roofing plants, fuel atomization in lime kilns, fuel oil blending and controlling viscosity of lubricating oils. *Bendix Aviation Corp., Cincinnati Div., 203 W. Third St., Cincinnati 2, Ohio.*

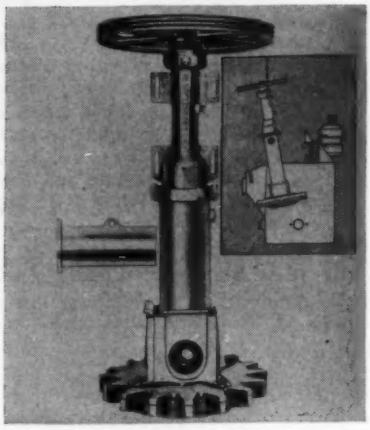
Four-way valve

A new hand-and-foot operated four-way valve with patented built-in, full-capacity, flow-control meters of the Venturi type has recently been introduced. It is an air and low-pressure hydraulic valve, specifically designed for the control of double acting air or hydraulic cylinders.

The valves are ruggedly built for heavy-duty service and long operating life, featuring one balanced spool using remarkable "0" ring-type of packing. The flow control meters are said to permit full-line volume without loss of pressure.

This basic valve is also available for remote pilot operation, cam, single or double solenoid, together with time-delay features. Noncorrosive throughout, it is available in four standard pipe sizes for air, oil or water, in pressure range 0-150 lb. *Airmatic Valve, Inc., 7317 Associate Ave., Cleveland 9, Ohio.*

New Products . . . . . .



Suspended unit shaft assembly

A new suspended unit shaft assembly designed to reduce "down time" for maintenance has been announced. Assembled as one unit, the shaft assembly is suspended in the tank by four bolts. Removal of the four bolts allows the mechanism to be lifted from the cell. Removal and replacement can be made in less than 10 minutes, according to the manufacturer. Parts for the new shaft assembly are interchangeable with parts for older models. A removable feed pipe enables the assembly to be adapted for either standard cell-to-cell or free-flow of pulp operation. *Denver Equipment Co., P. O. Box 5268, Denver 17, Colo.*

Temperature control valve

A new temperature control valve, designated as No. 1549, is pilot operated for sensitive, yet dependable service and is a "tight closing" type valve, according to the manufacturer. Particularly in the larger sizes, the valve is designed for high pressure service. The 5 and 6 in. sizes are double seated, while small valves are single seated.

Construction and operation are simple. The pilot valve is actuated by hydraulic expansion of the thermo-sensitive charge in a one-piece metal bellows. The pilot valve

proven by performance

Sutherland Breaker Trap

SUTHERLAND REFINER CORPORATION

TRENTON 8, NEW JERSEY

use "VEE GRIP" STOCK-PIPE FLANGE

QUICK ASSEMBLY • PERFECT ALIGNMENT • LOW COST • • EASIER CLEANOUTS

Can be adapted to any standard tubing size with minor change in O.D. of face ring.

OVERLY'S, INC. Box 263 NEENAH, WISCONSIN

DISTRIBUTED BY

FABRI-VALVE COMPANY OF AMERICA
PORTLAND 12, OREGON

FELKER BROS.- MARSHFIELD, WISCONSIN

WISCONSIN WIRE WORKS EQUIPMENT CORP. - APPLETON, WISCONSIN

Stadler, Hurter
& Company
CONSULTING ENGINEERS

Specializing since 1923 in all phases of design, modernization and expansion of pulp and paper mills from forest to finished product.

HEAD OFFICE: DRUMMOND BLDG., MONTREAL

New York Office: 76 Beaver Street

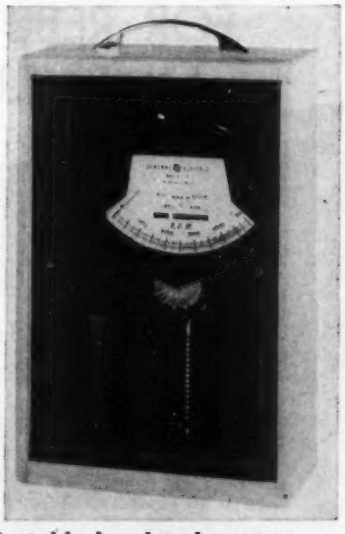
employs the inlet pressure to control the main valve, admitting the inlet pressure to the diaphragm chamber to open the main valve when temperature is low and allowing it to bleed off when temperature is high.

The valve has a 50° F. range of adjustment. Standard ranges are: 25 to 75, 75 to 125, 125 to 175, 175 to 225, and 225 to 275 (all in degrees F.). Other temperature ranges can be supplied. The valve is manufactured in sizes from ¾ in. to 6 in. *Klipfel Valves, Inc., Hamilton, Ohio.*

Synchronized-gear motor

For locations where dangerous fumes, inflammable gases, explosive substances or combustible dusts may exist, the new right-angle Syncrogear with explosion-proof motor has been announced. Available in 1 hp rating with speeds from 45 to 155 rpm, this 3-phase ac motor is known as Type SESV-GW. The explosion-proof motor is designed to comply with Underwriter's specifications for Class I—Group D, and Class II—Groups F and G service.

This right-angle Syncrogear incorporates a cantilever design to protect gear alignment. Mounting stresses are absorbed by the one-piece base, freeing the gear and motor housing of distortion. Type SESV-GW embodies splash lubrication, a hardened and ground worm, normalized castings and asbestos-protected windings. *U.S. Electrical Motors Inc., Box 2058 Terminal Annex, Los Angeles 54, Calif.*



Portable hand tachometer

A new, portable hand tachometer, featuring a scale-changing device which reduces misreading of its various ranges, has recently been developed.

Three different models, each having three ranges, are capable of measuring rotational speeds from 2 to 100,000 rpm and linear speeds from 2 to 10,000 fpm with accessories. Accuracy is plus or minus one per cent of full scale under all conditions, according to G-E engineers.

Applications of the tachometer in the paper industry include speed measurement of motors, generators, turbines, conveyors, and all continuous webs.

The equipment consists of two basic units: a head, which is placed against the moving object; and indicator, which is attached by a two-foot flexible electric cable. Weighing only 6 oz., the head unit is small enough to be placed in contact with rotating shafts or moving objects where little space is available.

Accessories include two external cone tips, an internal cone tip, a 0.1 ft. disk, a 1 ft. disk, a low-speed adapter, a high-speed adapter, and an extension arm, all stored in a compact carrying case along with the tachometer. *General Electric Co., Schenectady 5, N. Y.*

Three-coil overload protection

A new three-coil overload protection in the same enclosure as the two-coil overload protection is now available at little extra cost.

A feature of the three-coil starters is the adjustable heater coil. Four different ratings are possible from a single coil by merely changing its position. Motor protection within three per cent of usable motor instead of 10 or 12 per cent otherwise offered is an advantage claimed by the manufacturer. This results in more exact protection, less nuisance tripping, and more usable horsepower for new motors, as well as old ones. *Cutler-Hammer, Inc., 315 North 12th St., Milwaukee, Wis.*

proven by performance

Sutherland Inc. Pressure Washing*
Sold and Serviced by

PRESSURE WASHING

SUTHERLAND REFINER CORPORATION
TRENTON 8, NEW JERSEY

*U. S. Patent No. 2,355,091

SMIDTH

ROTARY KILNS FOR REBURNING LIME SLUDGE

The illustration above shows a modern, Smidth Rotary Kiln for reburning lime sludge at the plant of the West Virginia Pulp & Paper Co., Charleston, South Carolina.

F. L. Smidth & Co. are specialists in the design and manufacture of rotary kilns and have furnished numerous installations in many countries for burning lime, lime sludge, dolomite, magnesite, cement, ores, etc.

For Smidth Machinery apply to:

F. L. Smidth & Co., A/S
Vestergade 33,
Copenhagen K, Denmark

F. L. Smidth & Co.
11 West 42nd Street
New York 36, N. Y.

F. L. Smidth & Co., Ltd.,
105, Piccadilly,
London, W. 1, England

F. L. Smidth & Cie France
80 Rue Taitbout
Paris (9e) France

F. L. Smidth & Co. of Canada, Ltd.
11 West 42nd Street
New York 36, N. Y.

F. L. Smidth & Co. (Bombay) Ltd.
42 Queen's Road
Bombay, India

NEW LITERATURE

Books

WOODPULP. By Erland O. Bjööm. Translated from the original Swedish text by J. P. Firrell and I. R. de Maré. Published by AB Svensk Trävaru-Tidning (*Swedish Timber and Wood Pulp Journal*), Kungsgatan 17, Stockholm, Sweden. 5½ x 8. 360 pages. 25 Sw. kr. (approximately $4.85 U. S. coin).

This translated technical and commercial handbook is practically identical with the Swedish edition; but several sections have been supplemented, and various data have been brought up to date.

The book deals with technical as well as commercial aspects of the trade. The first part of the book is mainly of a general descriptive nature to orient the reader in the properties, uses, and methods of manufacturing the various pulp qualities. It accordingly constitutes the basis of the commercial part of the book and is written so as to be easily understood even by persons who have no technical training. The commercial part deals with the sale and shipment of woodpulp; these chapters are supplemented by extracts from various contract forms.

The following list of chapter headings will give an idea of the principal contents of the book: Historical Survey, Papermaking Fibres, The Handling of Pulpwood, The Manufacture of Woodpulp, Chemical By-Products, Testing Methods, The Manufacture of Paper and of Cellulose Derivatives, Sales Organization and Methods, The Manufacture of Paper and of Cellulose Derivatives, Sales Organization and Methods, Transport, and Statistics.

The forms of contracts and bills of lading, etc., given in the appendices are examples of documents used in practice; and at the end of the book are tables for converting weights and measures, as well as formulae for converting prices on various weight bases.

FRESH WATER FROM THE OCEAN. By Cecil B. Ellis. Published by Ronald Press Co., 15 East 26th St., New York 10, N. Y. 6¼ x 9¼. 217 pages. $5.00.

This new book, sponsored by the Conservation Foundation, investigates the prospects of salt-water conversion in projected capacities of 1,000 million gallons every 24 hours—approximately the daily consumption of New York City. It provides a sound basis for weighing the practicality of present and proposed conversion methods in large-scale operation, at a cost that can be met by cities, industries, and farming areas in need of water.

The book analyzes the basic matter and energy relationships with which any sea-water conversion method must deal. The various conversion methods are described and their economic feasibility analyzed with respect to plant construction, labor cost, maintenance, raw materials, and power.

Addressed not only to scientists but to everyone concerned with future water supply, the book is not written in highly technical language.

Staff members of Nuclear Development Associates, Inc., have contributed to this volume.

POLYMER DEGRADATION MECHANISMS. (Circular 525). Published by the National Bureau of Standards, U. S. Department of Commerce, Washington 25, D. C. 6 x 9¼. 280 pages. $2.25. (Order from the Government Printing Office, Washington 25, D. C.)

This book contains the Proceedings of the NBS Semicentennial Symposium on Polymer Degradation Mechanisms, held in September, 1951. The papers in this volume record the progress that has been made in elucidating the structure of the polymers and the mechanisms of their break-down. These papers were presented by scientists from throughout the world; a record of the discussion that followed each paper is also given. Much of the work carried out on the mechanisms of polymer degradation in the past decade is summarized.

Booklets and Pamphlets

TREE-VOLUME TABLES BASED ON FOREST SITE (Bulletin No. 29). Published by the State University of New York College of Forestry, Syracuse, N. Y. 4 x 9. 8 pages. 10 cents. This publication is designed to meet the need for tree-volume tables that are easily usable and that will apply with reasonable accuracy to different stands of timber. The problem is met by relating tree volume to forest site in addition to tree species and diameter. The tables were made from measurements taken on 13,000 sample trees of the most important species distributed over the various sites found in the Adirondack and Catskill regions. The data were collected during the course of the Adirondack-Catskill forest survey made by the College of Forestry in 1950-52.

TESTING PROCEDURES ON THE TESTING OF FIBER SHIPPING CONTAINERS. Published by Packaging Institute, 342 Madison Ave., New York 17, N. Y. 25 cents per test or $1.75 for set of seven tests. The tests comprise tentative procedures for: "Conditioning Paperboard, Fiberboard and Paperboard Containers for Testing" (PI Shipping Containers 1t-53), "Testing Shipping Containers in Revolving Hexagonal Drum" (2t-53), "Incline Impact Test for Shipping Containers" (3t-53), "Drops Test for Shipping Containers" (4t-53), "Compression Test for Shipping Containers" (5t-53), "Vibration Test for Shipping Containers" (6t-53), "Testing Puncture and Stiffness of Paperboard, Corrugated and Solid Fibreboard" (7t-53).

FORESTRY BOOKLETS. Published by Southeastern Forest Experiment Station, Asheville, N. C. 8 x 10½. Station Paper No. 36, by Elbert L. Little, Jr., and Keith W. Dorman, presents nomenclature and a description of "Slash Pine (*Pinus Elliottii*) Including South Florida Slash Pine." This booklet contains 82 pages. The purpose of 12-page Station Paper No. 37 "Lumber Grade Yields in the Loblolly-Shortleaf Pine Type by the Southern Pine Log Grades," by T. A. McClay, is to present lumber grade percentage recoveries and relative values obtained when applying a new log grading system at two separate localities in the loblolly-shortleaf pine type. "Defects in Hardwood Veneer Logs: Their Frequency and Importance," 45-page Station Paper No. 39, by E. S. Harrar, reports the results of the initial phase of a long-range research program leading toward the development of a universal set of log-grade rules for southern hardwood veneer logs.

OPERATING TENSION AND THE KENWOOD FELT MEASURING WHEEL. (Vol. II, No. 5). Published by F. C. Huyck & Sons, Rensselaer, N. Y. 6 x 9¼. 8 pages. The purpose of this bulletin is to discuss the Kenwood felt measuring wheel, a measuring instrument developed to assist paper mills in establishing operating conditions most conducive to good felt and machine performance. Three graphs, a diagrammatic sketch, and a photograph are included.

FIBERGLAS PRODUCTS FOR PAPERMAKING. Published by Owens-Corning Fiberglas Corp., 16 East 56th St., New York 22, N. Y. 8½ x 11. 15 pages. This booklet presents research findings, dating back to 1937, about Fiberglas papers. It is intended as a useful guide to the formulation and production of Fiberglas papers rather than as a comprehensive manual. Fiberglas' properties, applications, and sheet-making and processing characteristics are discussed. Numerous photographs and graphs are included.

GETTING THE MOST OUT OF YOUR VALVES. By William C. Hookway. Published by Cooper Alloy Foundry Co., Hillside, N. J. 8½ x 11. 4 pages. This article reprint covers the selection of valve types and materials, installation and operation hints, as well as inspection and maintenance pointers.

The Paper Industry

Professional and Business Services

Engineers

Industrial Plants • Textile & Paper Mills • Location Studies • Appraisals • Reports • Surveys

J. E. SIRRINE COMPANY

GREENVILLE SOUTH CAROLINA

Manufacturers' Publications

Though the co-operation of manufacturers and suppliers, THE PAPER INDUSTRY *lists the following catalogues, bulletins and booklets. They may be obtained without cost or obligation, unless otherwise specified, by writing direct to the manufacturers. Please address requests on your company letterhead.*

Motorized Reducers. Falk Corp., 3001 W. Canal St., Milwaukee 8, Wis.—Of interest to men who buy or use gear drives up through 75 hp rating, 26-page Bulletin 3100 gives selection tables, dimensions, weights, overhung load ratings, and thrust capacity ratings needed to select horizontal, vertical or right angle Falk "Motoreducers" in either the All-Motor or Integral design. A foldout section bound into the middle of the book contains illustrated information on mounting positions, low speed shaft connections, and product features, together with pictures of typical applications.

Metal Fittings. Mulconroy Co., 5342 Jefferson St., Philadelphia 31, Pa.—This new 6-page bulletin on electroplated steel or brass fittings for flexible plastic pipe contains descriptions, photographs and specifications for male thread adapters, couplings, clamps, ells, tees, water main adapters, Venturi jet adapters, etc.

Self-Cleaning Dust Collector. Pangborn Corp., Hagerstown, Md.—The Type "CH-3" self-cleaning cloth screen dust collector is described in 6-page Bulletin No. 915. Engineering features of the new dust collector, which uses the principle of reverse air flow for continuous cleaning of the cloth filters, are illustrated. Advantages are listed.

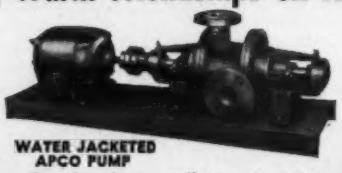
Safety Materials & Services. National Safety Council, 425 N. Michigan Ave., Chicago 11, Ill. — 52-page Occupational Safety Service Guide 2.1 provides company safety directors with a complete catalogue of the many and varied accident prevention aids available from the Council, including its periodicals, newsletters and a complete library of technical and administrative publications covering all phases of occupational accident prevention. Information on the subjects covered in the basic and advanced courses of the Council's Safety Training Institute is also included. Other materials described are posters, films, booklets, and several hundred made-to-order 5-minute safety talks.

Gum Arabic. Morningstar, Nicol, Inc., Gum Dept., 630 W. 51st St., New York 19, N.Y.—4-page Technical Service Bulletin No. G-101 provides general information on the origin, physical and chemical properties, and mesh specifications of gum arabic, a water soluble natural gum. It describes and shows grinding and processing equipment employed by the manufacturer to prepare grades of arabic for various industry uses. Suggested uses are presented. Preparation of solutions, moisture characteristics and recommended preservatives are also featured.

SALES MANAGER

Paper manufacturer seeks sales manager of light papers; responsible for Pacific Coast territory. Eight to ten years in sales essential; supervisory experience preferable. Location: San Francisco. Age: Under 45. Salary: $10-15,000 plus benefits. Excellent promotional opportunity. Address: Box 580, The Paper Industry.

Making Warm Friendships on Hot Jobs



WATER JACKETED APCO PUMP

Developed especially for the efficient handling of high temperature and highly volatile liquids. Delivers outstanding performance. Unbeatable on high head, small capacity duties.

PUMPS *by Aurora*

For Every Purpose

APCO Turbine-Type PUMPS

—Ideal for "1001" duties where small capacities and high heads predominate. Get acquainted.

AURORA CENTRIFUGAL PUMPS

are available in many types and sizes—all noted for their streamline coordination between impellers and shells.

We Invite Your Special Pump Problems

Write for CONDENSED CATALOG "M"

DISTRIBUTORS IN PRINCIPAL CITIES

AURORA Always PUMPS

AURORA PUMP COMPANY

DIVISION OF THE NEW YORK AIR BRAKE COMPANY

110 LOUCKS STREET, AURORA, ILLINOIS

Cleaning & Maintenance of Clad Steel Equipment. Lukens Steel Co., Coatesville, Pa.—An illustrated guidebook, "Cleaning and Maintenance of Clad Steel Equipment," outlines for maintenance personnel recommended cleaning procedures for those types of surface contamination which are potentially harmful. It contains solution formulas for cleaning specific kinds of surfaces and includes information on handling clad steel equipment during relocations.

Wall Louvers. Burt Mfg. Co., Dept. PI, Akron 11, Ohio—This 8-page bulletin covers Burt's complete wall louver line. General purpose louvers, fixed and adjustable styles and industrial louvers are detailed and illustrated. Louver operators, screens, and specification data are also included.

Oils. Sun Oil Co., 1608 Walnut St., Philadelphia 3, Pa.—Physical properties and advantages of new Solnus oils are discussed in Sunoco Technical Bulletin No. 17.

Zinc Dust. American Smelting & Refining Co., Federated Metals Div., 120 Broadway, New York 5, N.Y.—4-page Bulletin No. 141 describes common applications of zinc dust, including its use in the paper industry. The publication gives details on the advantages of zinc dust in the manufacture of bleaches, as a reducing agent, as a catalyst, purifier, precipitating agent, as an additive to grease and other materials for pipe thread lubrication, and particularly in paints.

Btu Meter. Minneapolis-Honeywell Regulator Co., Industrial Div., Station 64, Wayne & Windrim Aves., Philadelphia 44, Pa.—2-page Instrumentation Data Sheet No. 10.19-1 describes the operation and application of the Brown Btu meter, which simultaneously records differential temperature and flow of a liquid, and provides direct reading of Btu. Photographs and a schematic diagram are included.

Heat Exchangers & Hot Water Storage Heaters. Patterson-Kelley Co., Inc., 537 Warren St., East Stroudsburg, Pa.—Catalogue No. 5, consisting of 16 pages, covers more than a dozen types of hot water storage heaters and heat exchangers. Included are horizontal and vertical hot water storage heaters, instantaneous water heaters, convertors, condensate coolers, dishwasher boosters, fuel oil heaters and instantaneous suction heaters for viscous fluids. Tables enable selection of the correct equipment for given operating condition. Typical examples demonstrate use of the tables.

Motor Starters. Allis-Chalmers Mfg. Co., 991 S. 70th St., Milwaukee, Wis.—Size O-3 ac across-the-line motor starters are described in a new 8-page bulletin, No. 14B7132A. It covers manual and magnetic types of starters and combination and reversing starters, as well as push button control stations. Operating arrangements are described and three types of enclosures—general purpose, watertight, dust-tight, hazardous dust location, hazardous gas location and open type—are given. A table shows motor voltage and motor maximum hp (3 phase) application to each of the four NEMA sizes of starters described.

Eleven Publications for Papermakers

Pulp and Paper, Volume 1	$15.00
Pulp and Paper Volume II	15.00
Modern Pulp and Paper Making	9.50
Procedure Handbook of Arc Welding	2.00
Outside U.S.A.	2.50
Drying of Paper on the Machine	1.50
Notes and Observation on Beaters	1.00
Lessons in Papermaking—Part 1	1.00
Lessons in Papermaking—Part 2	1.00
Trouble on the Paper Machine	.75
Pulp Bleaching (A Symposium)	.50
Technology of Papermaking Fibres	.50

Mail your order with payment to:

***The* PAPER INDUSTRY**

431 S. Dearborn Street, Chicago 5, Illinois

EXECUTIVES WANTED

We can place several board mill men, including a mill manager, a general supt., and a supt. for a single board mill. The Salaries are attractive.

POSITIONS OPEN

We can place — Mill manager or gen. supt. paperboard mill; supt. converting plant, cellulose wadding and facial tissue; technical quality control man for fine paper mill, preferably one with degree in chemistry. Electrical and plant engineers; salesmen for board and folding cartons, decorative papers, etc.; converting machine mechanic for So. Amer. Chemists, chem. engineers and tech. directors; finishing foremen; industrial engineers; recent graduates in chemical, industrial or mechanical engineering; machine tenders and back tenders.

If you are available for a position in paper or pulp mfg. or paper converting, *send us your resume.* It will be in confidence. No charge unless you accept employment through our service.

CHARLES P. RAYMOND SERVICE, INC.

Phone: LIberty 2-6547 — 294 Washington St. — Boston 8, Mass.

FOR SALE — Laboratory beater, 10 lb. Dilts with washer and motor. Gas-fired, horizontal, rotating nine-gallon steel pressure vessel for pulping wood or fibrous material with or without Micromax Model R temperature recorder controller. Combs Gyratory Riddle with three 20-inch screens, equipped with 1/6 H. P., 115 V motor. A. B. Dick Co., 5700 W. Touhy, Chicago 31, Ill.

WANTED — Assistant paper mill superintendent for medium size New England mill — not over 45. Excellent opportunity for advancement. High speed machines. Technical education desirable but not a requirement. All replies confidential. Salary open. Address: Box 575, The Paper Industry.

WANTED — SUPERINTENDENT. An excellent opportunity for a keen, energetic young man to join the staff of fine paper mill currently making rag content papers for commercial, Government and technical purposes. Successful applicant will act as Ass't. Supt. for a period and when ability proven, promotion will follow. Remuneration commensurate with experience. Applications, which will be treated in strictest confidence, should be addressed to Box 576, The Paper Industry.

WANTED — AIR DRIER OPERATOR with experience on Clark Aiken Air Drier. Only men capable of taking full responsibility of machine and its operation need apply. Address: Box 577, The Paper Industry.

WANTED — MACHINE TENDER. Experienced machine tender required for fine paper mill making rag content papers. Only men capable of taking full charge of machine and its operation need apply. Address: Box 578, The Paper Industry.

WANTED — BEATER ENGINEER. Mill in Midwest making high grade rag content papers has vacancy for Beater Engineer who is also a good color man. An excellent opportunity for the capable man. Apply in first instance to Box 579, The Paper Industry.

you can save

. . . hours in cleaning time and countless cleaning dollars. Simply flip the switch on this Oakite Hot-Spray Unit.

More and more, cost-conscious paper mill operators realize it takes mechanized cleaning to provide maximum results in minimum time. That's why so many are now using the Oakite Hot-Spray Unit to whip the tough jobs such as cleaning tile stock beaters, drying rolls, glass brick windows and miscellaneous equipment.

Here's how you save: The Oakite Hot-Spray Unit sprays detergent at the rate of two gallons per minute, provides thorough cleaning in only a fraction of the time manual methods take; less detergent is needed because heat and physical force share the cleaning load; operation of the unit is simple, efficient —one man can easily handle it.

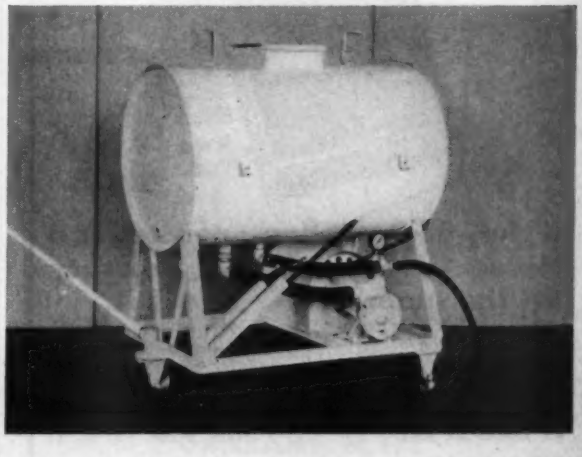
Write today for more information. FREE illustrated booklet gives specifications and details of construction. Address: Oakite Products, Inc., 68 Rector Street, New York 6, N. Y.

SPECIALIZED INDUSTRIAL CLEANING

OAKITE

MATERIALS • METHODS • SERVICE

Technical Service Representatives in Principal Cities of U. S. and Canada



Burtonite® #7

A NEW and BETTER BEATER ADDITIVE

COLD WATER SOLUBLE

0.5 to 1% on weight dry fiber **reduces refining time** up to 52% while maintaining tensile strength and bettering formations. Permits usage of **higher percentages** of **short fibered pulps.** Finished paper has **higher porosity,** more fold endurance, less hygro-expansivity, less tendency to curl, and if pigmented, no "two-sidedness". **Wet strength** can be imparted by sizing with borated water and no difficulties re-pulping broke are created.

Works well with both acids and alkalies.

THE BURTONITE CO.

Member NATIONAL ASSOCIATION OF CHEMICAL MANUFACTURERS

NUTLEY 10, NEW JERSEY

Telephone: NUtley 2-0031

"Better Products . . . Through Research"©

PHOTOVOLT

pH Meter MOD. 115

A full-fledged line-operated pH Meter of remarkable accuracy at the unprecedented price of $115.- (complete incl. electrodes)

Write for bulletin #225 to

PHOTOVOLT CORP.

95 MADISON AVE. NEW YORK 16, N. Y.

MARKET QUOTATIONS

Rosin (Gum)— New York, per 100 lbs.

B	8.55—
F	8.55—
G	8.55—
WW	8.80—

Rosin (Wood), carlots, F.O.B. South 4.75—

Salt Cake—

Dom. bulk (wks) ton.	21.50 to 22.00
Imp. bulks on dock— (Atl. ports) ton (Nom.)	22.00—

Soda Ash—

Bulk (works) cwt.	1.35—
Paper bags, cwt.	1.70—

Soda (Caustic)—

Solid drums, cwt.	3.85 to 4.50
Ground and flake, drums, cwt.	4.25 to 5.00

Sodium Silicate—

60 deg. 55 gal. drums, (works) cwt.	1.60 to 1.70
40 deg. 35 gal. drums, (works), cwt.	1.35 to 1.40

Starch—

Pearl, 140 lb. bags, cwt.	6.39—
Pearl, barrels, cwt.	6.39—
Paper (Sp.) bags, cwt.	6.39—
Powdered, barrels, cwt.	6.60—

Sulphur (Crude)

(Mine) bulk, long ton	26.50 to 28.00

Talc—

Dom. 100 lb. bags (mine) ton	25.00 to 28.00
Canadian	35.00 to 45.00

Titanium Dioxide—

Barium Pig, bbls., lb.	.22½ to .23
Calcium Pig, bbls., lb.	.22½ to .23

Zinc Sulphide, bbls., lb. 11.50 to 12.00

WOOD PULP

Quotations on domestic and Canadian wood pulp, dollars per short air dry ton, delivered consuming mills including basic freight allowances, follow:

Bleached Sulphite	140.00—
Bleached Sulphite, Canadian	140.00—
Unbleached Sulphite	130.00—
Unbleached Sulphite, Canadian	130.00—
Bleached Soda	140.00—
Bleached Soda, Canadian	140.00—
Kraft, Bleached	145.00—
Kraft, Bleach., Southern	142.50 to 150.00
Kraft, Bleach., Canadian	145.00 to 150.00
Kraft, Unbleached, Northern	132.50—
Kraft, Unbleached, Southern	95.00 to 105.00
Kraft, Unbleached, Canadian	100.00 to 125.00
Kraft, Semi-Bleached, Southern	140.00—
Sulphite Screenings	72.50—
Sulphate Screenings	67.50—
Groundwood	82.50 to 87.50

Quotations on imported wood pulp, dollars per short ton, on dock American Atlantic ports with varying freight allowances, follow:

Bleached Sulphite, Swedish	135.00 to 140.00
Bleached Sulphite, Norwegian, freight allowed	135.00 to 140.00
Bleached Sulphite, Finnish, freight allowed	140.00—
Unbleached Sulphite, Swedish	115.00 to 122.50
Unbleached Sulphite, Finnish, freight allowed	120.00 to 125.00
Kraft, Unbleached, Swedish, freight allowed	105.00 to 110.00
Kraft, Unbleached, Finnish, freight allowed	105.00 to 135.00
Kraft, Bleached, Swedish, on dock	140.00 to 142.50
Kraft, Bleached, Norwegian	

PAPER

Quotations are mill quotations New York City

Boards—

Prices per ton, delivered, 10 tons or more:

Plain Chip	70.00—
News vat lined chip	85.00—
Filled news	72.50—
Solid news	75.00—
White vat lined chip	125.00—
Chip tube and can stock	100.00—
Single manila lined chip	140.00—
Single jute lined chip	125.00—
Kraft liner	117.50 to 122.50

White patent coated:

.020	160.00—
.018	162.50—
.016	165.00—

Book Paper—

Machine coated, two sides

70 lb. No. 2 enamel, 25x 4 cases	$17.25
38-500, trimmed 4 sides. Carloads	$16.30
45 lb. enamel, 25x38-500, 4 cases	$13.05
trimmed 4 sides. Carloads	$12.10

Uncoated

55 lb. No. 2 offset, 25x38 4 cases	$14.80
500, trimmed 4 sides. Carloads	$13.85
50 lb. A Grade English Finish, 25x38-500, un- 4 cases	$14.05
trimmed Carloads	$13.10
20 lb. envelope, 17x22-500, untrimmed Carloads	$12.40
16 lb. tablet, 17x22-500 Carloads	$11.35

Rag Content Bond—

Extra 100% rag	70.45—
100% rag	62.65—
75% rag	48.15—
50% rag	38.90—
25% rag	31.75—

Rag Content Ledger—

Extra 100% rag	72.65—
100% rag	63.90—
85% rag	52.50—
75% rag	49.40—
50% rag	40.20—
25% rag	33.00—

Sulphite Bond—

Air dry bond (Watermarked)	19.00—
No. 1 bond (M.F. watermarked)	15.00—
No. 2 bond (M.F. watermarked)	14.00—
Plain bond (M.F. unwatermarked)	14.00—

Sulphite Ledger—

No. 1, M.F. watermarked	20.50
No. 2, M.F. watermarked	19.50
Plain, M.F. unwatermarked	19.00

News— per ton

Rolls, Standard (Contract)	125.00 to 126.00
Rolls (Spot)	(Nominal)
Sheets	138.00—

Tissues (Carlots)— per ream

White No. 1	1.75—
White No. 2	1.35—
Bleached Anti-Tarnish	2.20—
Colored	2.00—
Anti-Tarnish Kraft	1.65—
Manila	2.00—
Napkins, semi-crepe (12½ lb. to M shts.) per cs.	.90—
Napkins, full crepe and embossed (12½ lb. to Mshts.) per cs.	.90—
Toilet, Bleached (M shts.) per cs.	9.35—
Toilet, Unbleached (M shts.) per cs.	7.90—

Towels— per case

Bleached	6.80—
Unbleached	5.90—

Wrappings (Kraft)— per cwt.

Standard wrapping	8.00—
Butchers, counter rolls	8.50—
Standard bag, mill rolls	7.75—
Shipping sack, mill rolls	8.00—
Gumming, mill rolls	8.25—
Asphalting, mill rolls	8.00—
Envelope, mill rolls	9.50—

MARKET QUOTATIONS

RAGS (Domestic)

NEW RAGS

The following are quotations to mills, f.o.b. New York:

No. 1 White Shirt Cuttings	12.50 to 13.00
New Unbleached Muslins	14.50 to 15.00
Fancy Shirt Cuttings	7.25 to 7.50
No. 1 Percales	6.75 to 7.00
No. 1 Washables	3.00 to 3.25
No. 1 Light Silesias	7.00 to 7.25
No. 1 Light Prints	5.75 to 6.00
Light Flannelettes	7.25 to 7.50
Cottonades	3.75 to 4.00
Blue Overalls	7.00 to 7.50
Blue Cheviots	6.50 to 7.00
Canton Flannels, Bleached	11.00 to 11.25
Canton Flannels, Unbleached	11.00 to 11.25
Osnaburg Cuttings	8.50 to 9.00
Underwear Cuttings, Bleached	14.00 to 14.50
Underwear Cuttings, Unbleached	14.00 to 14.50
Khaki Cuttings—	
Sun Tan	6.75 to 7.00
Mixed	3.75 to 4.00
Linen Cuttings—	
American	7.25 to 7.50
White	13.00 to 14.00
Grey	13.00 to 14.00

RAGS (Domestic)

OLD RAGS

Quotations to consuming mills, dollars per hundred pounds, f.o.b. New York, follow:

Roofing	per cwt.
No. 1	1.10 to 1.20
No. 2	.80 to .90
No. 3 and 4	.60 to .70
Twos and Blues—	
Repacked	2.25 to 2.50
Thirds and Blues—	
Repacked	2.00 to 2.25
Miscellaneous	1.65 to 1.85
Whites, No. 1—	
Repacked	3.75 to 4.00
Miscellaneous	3.25 to 3.50
White, No. 2—	
Repacked	2.75 to 3.00
Miscellaneous	2.25 to 2.50

RAGS (Foreign)

ex dock New York City

NEW RAGS

	per cwt.
New Dark Cuttings	Nominal
New Mixed Cuttings	
New Light Silesias	
Light Flannelettes	
Unbleached Cuttings	
New White Cuttings	
New Light Oxfords	
New Light Prints	

RAGS (Foreign)

ex dock New York City

OLD RAGS

	per cwt.
No. 1 White Linens	Nominal
No. 2 White Linens	
No. 3 White Linens	
No. 4 White Linens	
No. 1 White Cottons	
No. 2 White Cottons	
No. 3 White Cottons	
No. 4 White Cottons	
Extra Light Prints	
Ord. Light Prints	
Med. Light Prints	
Dutch Blue Cottons	
French Blue Cottons	
French Blue Linens	
Checks and Blues	
Linsey Garments	
Dark Cottons	
Old Shopperies	

ROPE and BAGGING

f.o.b. and ex dock New York City

	per cwt.
Gunny No. 1—	
Foreign	4.25 to 4.50
Domestic	4.25 to 4.50
Wool Tares—	
Light	4.50 to 4.75
Heavy	4.75 to 5.00
No. 1 Scrap Bagging	3.75 to 4.00
Manila Rope—	
No. 1 large	6.00 to 6.50
No. 1 small	5.00 to 5.50
Sisal Rope—	
No. 1 large	5.50 to 5.75
No. 1 small	5.00 to 5.25
New Burlap Cuttings	5.75 to 6.25
Jute Threads—	
Foreign (Nom.)	6.00 to 6.25
Domestic	6.25 to 6.50
Strings—	
No. 1 sisal	5.00 to 5.25
No. 2 sisal	4.50 to 4.75
Soft jute	5.00 to 5.25
Mixed	2.75 to 3.00

WASTE PAPER

The following are quotations, dollars per ton, for No. 1 packing f.o.b. New York:

Shavings—	per ton
Hard White Env. Cuts	115.00 to 125.00
Hard White No. 1	90.00 to 95.00
Soft White, one-cut	75.00 to 80.00
Soft White, No. 1	55.00 to 60.00
Coated Soft	40.00 to 45.00
Fly Leaf No. 1	25.00 to 30.00
Fly Leaf, Woody No. 1	25.00 to 30.00
No. 2 Mixed Col. Woody	20.00 to 25.00
Flat Stock—	
No. 1 Heavy Books and Magazines, Repacked	22.00 to 24.00
Mixed Books	16.00 to 17.00
Ledger Stock—	
No. 1 White	55.00 to 60.00
No. 1 Mixed (Colored)	35.00 to 37.50
Manilas—	
New Env. Cuttings	65.00 to 70.00
New Cuts, One-Cut— Extra Manilas	17.00 to 18.00
Manila Tab Cards, Free of Ground Wood	75.00 to 80.00
Colored Tab Cards	50.00 to 55.00
Kraft—	
New Envelope Cuttings	62.50 to 67.50
Tripled Sorted No. 1 100%	40.00 to 45.00
No. 1 Old Assorted	27.50 to 32.50
News—	
White Blank	60.00 to 65.00
Overissue	22.00—
No. 1 Folded	14.00—
Old Corrugated Containers	20.00—
New Jute Corrugated Cuts	26.00—
Mill Wrappers	12.00—
Box Board Chips	9.00—
No. 1 Mixed Paper	8.00—

CHEMICALS

f.o.b. shipping point

Alum (Papermakers)—	
Lump, cwt.	5.05—
Ground, cwt.	4.30—
Powdered, cwt.	5.10—
Blanc Fixe—	
Pulp, bulk, ton	100.00—
Dry, barrels	105.00—
Bleaching Powder— Drums, cwt.	5.00 to 6.00
Casein (Domestic Standard) 20-30 mesh (bags), lb. 80-100 mesh (bags), lb.	27.00—
Argentine, lb.	24.50 to 26.00
China Clay—	
Domestic Filler Bulk (mine) ton	10.50 to 16.00
Domestic Coating Bulk (mine) ton	17.00 to 25.00
Imported (ship side) Bulk (lump) ton	20.00 to 30.00
Chlorine—	
Tank cars (wks) cwt.	2.93—
Gelatine (silicon), lb.	1.25 to 1.35
Glyc. (C.P.) drums, lb.	.29½ to .30
Litharge, powd. bbl. lb.	.15½ to .16

Start right.... with the right FELT

Are you getting the production you should be getting to meet today's competitive market? Starting with an Oriskany Waterbury Felt can help you keep quality up to standard and keep production running smoothly . . . for at Oriskany we start right at the beginning to make sure you get the right felt for your job!

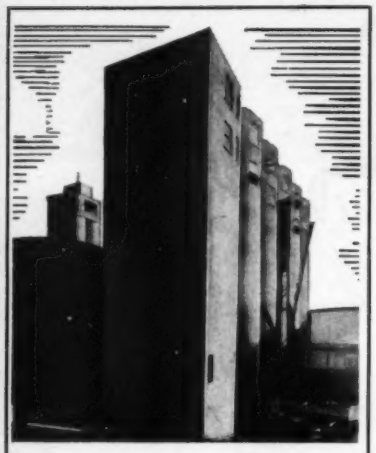
We blend the world's finest selection of wools . . . and we make our own yarns under constant scientific controls. Step by step, through weave and finish and inspection, skilled hands are at work in our modern mill tailoring your felt to your exact specifications. Whether you are running the finest tissue or the heaviest board, there is an Oriskany Felt made to do the job *better . . . faster . . . at less cost!*

First choice—because They last

Oriskany WATERBURY FELTS

H. WATERBURY and SONS CO.

ORISKANY, N.Y.



Save Man Hours

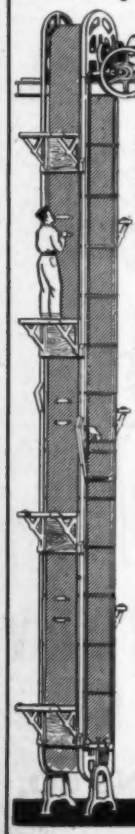
Equip Your Digester House with a

HUMPHREY

Employees' Manlift

ELEVATOR

Eliminate stair climbing—save time—reduce employee fatigue. The endless belt provides continuous up and down transportation to and from sampling and operating floors.



Easy and safe to operate with ready-at-hand stop and go controls and the exclusive Humphrey Safety Features.

Can be installed in any Multiple Floor Building

Send us your requirements . . . we'll furnish complete information and prices.

HUMPHREY ELEVATOR COMPANY

Inc.

Since 1887

340 1st Avenue N. W.

Faribault, Minnesota

Export Sales Representative:

Scheel International, Inc.
4279 N. Lincoln Ave.,
Chicago 18, Ill.

Index to Advertisers

When writing them, please mention The PAPER INDUSTRY.

Refer to the Paper and Pulp Mill Catalogue and Engineering Handbook at your mill office, for complete listing of all advertisers' products.

ACF Industries, Inc., Valve Div.
Advertising Council, Inc.
Albany Felt Company
Amercoat Corporation 559
American Cyanamid Co. 3rd Cover
Antara Chemicals Div., General Dyestuff Corp.
Appleton Machine Co., The
Appleton Wire Works, Inc. 536
Appleton Wood Products Co. 639
Appleton Woolen Mills 558
Armour and Company
Armstrong Machine Works 553
Arnold, Hoffman & Co., Inc. 605
Askania Regulator Company 618
Asten-Hill Mfg. Co.
Aurora Pump Company 644

Babcock & Wilcox Co., Tubular Products Division 540
Bagley & Sewall Co., The
Bailey Meter Co. 598
Barco Manufacturing Co. 527
Bauer Bros. Co., The 555
Beloit Iron Works
Binks Manufacturing Co.
Bird Machine Company 566
Bowsher Co., The N. P.
Burtonite Company, The 646

Cameron Machine Co. 569
Carthage Machine Co.
Chemipulp Process Inc.
Chicago Bridge & Iron Company 532
Classified Advertising 644, 645
Clinton Foods Inc.
Combustion Engineering, Inc. 538
Corn Products Refining Co. 542
Cuno Engineering Corp.
Curlator Corporation

DeZurik Shower Company
Dietert Co., Harry W. 622
Draper Brothers Company 568
du Pont de Nemours & Co., E. I. 547

Eastwood-Nealley Corporation
Edgar Brothers Company 530-531
Electric Eye Equipment Company
English China Clays Sales Corp. 632

Fabri-Valve Co. of America
Falk Corporation, The 537
Federal Fawick Corporation
Fisher Governor Co. 528
Fiske Brothers Refining Co., Lubriplate Division 630
Fritz Publications, Inc. 645, 649

Garlock Packing Co., The
General Chemical Division, Allied Chemical & Dye Corporation 554
General Dyestuff Corporation
Gilbert & Nash Company 620
Goslin-Birmingham Mfg. Co.
Graton & Knight Co. 608
Griswold and Johns 631

Hanchett Manufacturing Co. 624
Hercules Powder Company 541
Hillside Laboratory 632
Hooper & Sons Co., Wm. E. 552
Hubinger Company, The
Hudson-Sharp Machine Company 633
Humphrey Elevator Company 648
Huyck & Sons, F. C. 534

Improved Machinery, Inc. 562
Industrial Cypress Lumber Co.
Industrial Engr. Equipment Co.

Jackson & Church Company 2nd Cover
Jenssen Company Inc., G. D. 639
Johnson Corporation, The 565
Jones & Sons Company, E. D. 561

Kalamazoo Tank & Silo Co.
Kamyr Inc.
Kelco Company 535
Kewanee-Ross Corporation 564
Kidder Press Company

Ladish Co.—Tri-Clover Division 557
Langston Co., Samuel M.
Layne & Bowler, Inc. 607
Leeds & Northrup Company
Lewellen Manufacturing Co. 640
Lindsay Wire Weaving Co., The 621
Link-Belt Company 545
Lockport Felt Company
Lodding Engineering Corp. 650
Lubriplate Div., Fiske Brothers Refining Company 630
Lunkenheimer Co., The 4th Cover

Manhattan Rubber Division 549
Midvale Company, The
Modern Engraving & Machine Co.
Morden Machines Company 556
Mt. Vernon-Woodberry Mills, Inc.
Murray Mfg. Co., D. J.

Nash Engineering Co., The 609
National Aluminate Corp. 1st Cover
National Aniline Div., Allied Chemical & Dye Corporation 543
National Safety Council 629
National Starch Products, Inc.
Naylor Pipe Company 635
Newcomb-Detroit 622
Nichols Engr. & Research Corp.

(Continued on facing page)

Nitrogen Division, Allied Chemical & Dye Corporation 560
Norton Company

Oakite Products, Inc. 645
Oldbury Electro-Chemical Co.
Oliver United Filters, Inc.
Overly's Inc. 641

Pandia, Inc. 615
Paper and Pulp Mill Catalogue 649
Paper Industry, The 645
Penick & Ford, Ltd., Inc. 616
Perkins & Son, Inc., B. F. 612
Photovolt Corporation 646
Poole Foundry & Machine Co. 624
Powell Valves 533
Pusey & Jones Corp., The

Raybestos-Manhattan, Inc. 549
Raymond Service, Inc., Chas. P. 645
Red-Ray Mfg. Co., Inc.
Ronningen-Petter Company 622
Ross Engineering Corp., J. O.
Ross Midwest-Fulton Corp. 633

Sandy Hill Iron & Brass Works 624
Shenango-Penn Mold Company
Shuler & Benninghofen 551
Sirrine Company, J. E.
SKF Industries, Inc. 626
Smidth & Co., F. L. 642
Solvay Process Division, Allied Chemical & Dye Corporation 548
Southeastern Cylinder Engraving Co.
Stadler, Hurter & Company 641
Staley Mfg. Co., A. E. 539
Standard Oil Co. (Indiana) 563
Stebbins Engineering & Mfg. Co. 614
Stein, Hall & Company 632
Sticht Co., Inc., Herman H.
Stickle Steam Specialties Co. 544
Stockham Valves & Fittings
Sutherland Refiner Corp.
638, 639, 640, 641
Swenson Evaporator Company 1st Cover

Taylor-Wharton Iron & Steel Co. 611
Testing Machines, Inc.
Texas Gulf Sulphur Co. 636
Titanium Pigment Corporation 550
Tri-Clover Division—Ladish Co. 557
Turner Halsey Company

U.S.A.—Treasury Dept.

Valley Iron Works Company 628
Vanderbilt Co., Inc., R. T. 570

Waterbury & Sons Co., H. 647
Waterbury Felt Co., The
Weyerhaeuser Timber Co.
Whiting Corporation
Williams-Gray Company 633
Wisconsin Wire Works 638
Wolferz Alloy Equipment, E. C. 627
Worthington Corporation

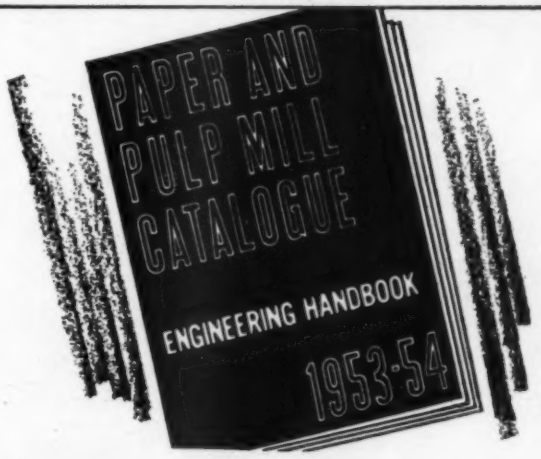
Yarnall-Waring Company 546
Youngstown Welding & Engineering Company, The

Professional & Business Services Section

Sirrine Company, J. E. 644

You'll find it in the NEW 1953-54

Paper and Pulp Mill Catalogue



1 **Latest Information**
ON MACHINERY, EQUIPMENT, MATERIALS, CHEMICALS

2 **Sources of Supplies . . .**

3 **Vital Facts of the Industry . . .**

3 BOOKS IN ONE:

MANUFACTURERS CATALOGUE SECTION . . . contains pages and catalogue inserts, giving exact and complete data by manufacturers regarding their products as they apply to the industry . . .

BUYERS SERVICE SECTION . . . is a comprehensive list of more than 4000 products used in the industry, giving a description of their application and the names of manufacturers — 170 pages! . . .

ENGINEERING HANDBOOK . . . is an authoritative compilation of engineering facts of the industry; and provides quick information for the paper and pulp mill executive — 138 pages and more of data, formulas, graphs, charts, and tables.

☆ ☆ ☆ ☆ ☆ ☆

Paper and Pulp Mill Catalogue and The PAPER INDUSTRY are published by

FRITZ PUBLICATIONS, Inc. 431 SOUTH DEARBORN STREET CHICAGO 5, ILLINOIS

Lodding Means Precision

Optical check for straightness with doctor in working position. One of many reasons why your Lodding doctor comes to you ready for the kind of action your production requires.

LODDING ENGINEERING CORPORATION
WORCESTER, MASSACHUSETTS
REPRESENTED BY
W. E. GREENE CORPORATION • WOOLWORTH BLDG., NEW YORK

For true whiteness . . . excellent opacity

in waxed-paper wraps UNITANE 0-110

Titanium Dioxide

The point-of-purchase message is sure to attract the discriminating shopper when displayed against the whiteness of UNITANE® titanium dioxide. UNITANE 0-110 has the high water dispersibility and particle fineness to give excellent whiteness and opacity. A test run is sure to prove its operating ease and efficiency.

Ask your Cyanamid Pigments representative for samples and full information.

AMERICAN Cyanamid COMPANY

PIGMENTS DIVISION
30 Rockefeller Plaza, New York 20, N. Y.

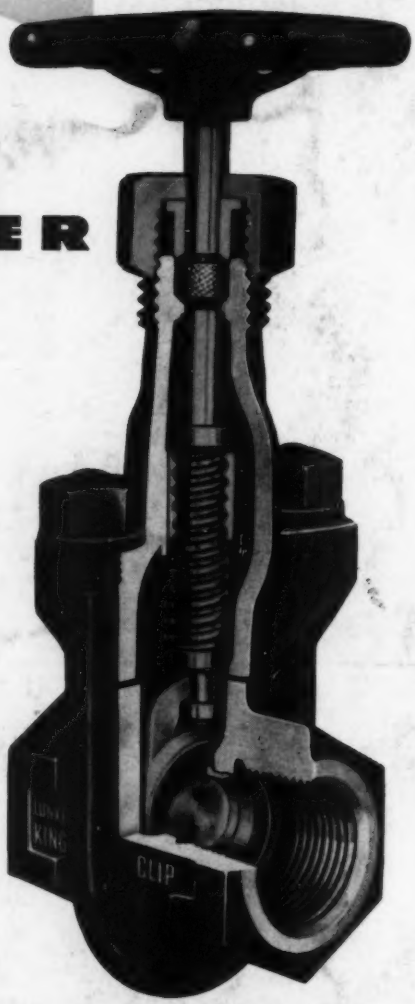
Branch Offices and Warehouses in Principal Cities

Tightest gate valve . . . . . you ever used!

the original clip valve with the NEW non-slip® handwheel*

King-clip®

by LUNKENHEIMER



It closes tight . . . it stays tight . . . and here are four good reasons why:

The new Non-Slip Handwheel provides a firmer, more comfortable grip for closing — even when the operator's hands are wet or greasy.

The body provides unusual ruggedness — protects the valve against distortion from wrenching or pipe stresses . . . and the steel clip permits quick disassembly and reassembly.

Extra thread length prevents pipe ends from jamming against diaphragm or seat rings to force them out of line. Threads accommodate both A. P. I. and standard threaded pipe.

Stemalloy* stems, in the Iron Body Bronze Mounted patterns, have amazing resistance to thread wear. Millions are in use, and *not one* has ever been returned due to wear failure.

LUNKENHEIMER
QUALITY

BRONZE · IRON · STEEL

Ask your Lunkenheimer Distributor about "King-clip" — the original Lunkenheimer clip valve with cast-in drain channels and a bonnet-thread bushing for perfect stem alignment. For full details, request Circular 561 from your distributor or The Lunkenheimer Company, Box 360S, Cincinnati 14, Ohio.

*Patented

LUNKENHEIMER®

THE ONE *Great* NAME IN VALVES

L-753-4